Pryda's Guide for Western Australian Builders on Prefabricated Timber Truss & Frame

November 2010

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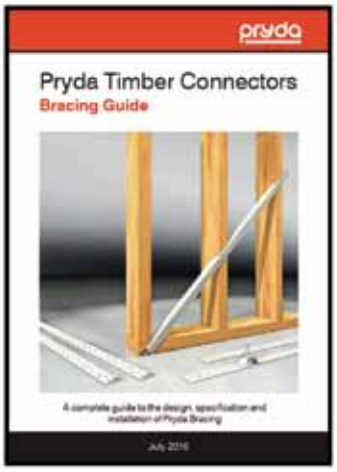
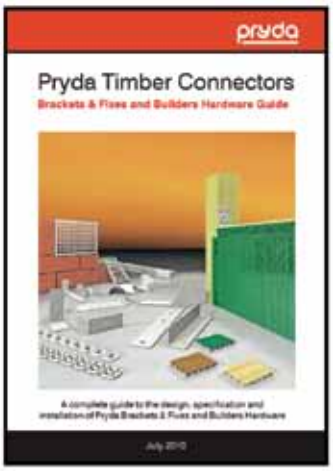
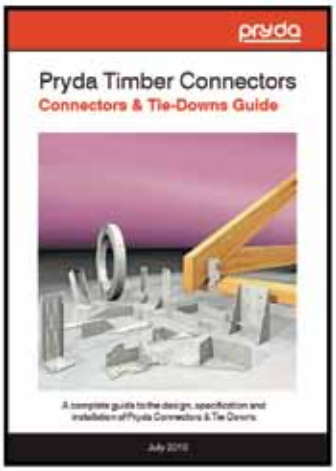
More detailed design information on our range of timber connectors can be accessed via our design guides. The guides provide information on:

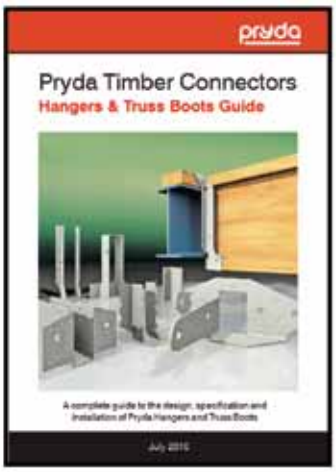
- Specifications and dimensions
- Applications
- Installation techniques
- Design capacities

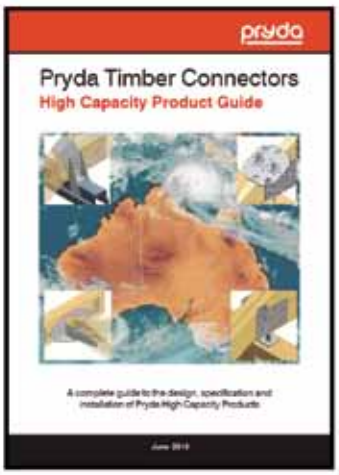
The product design guides and additional copies of the Pryda Western Australian Truss and Frame guide are available free of charge by visiting the Pryda website **www.pryda.com.au** or by telephoning Pryda on **1800 810 741**.

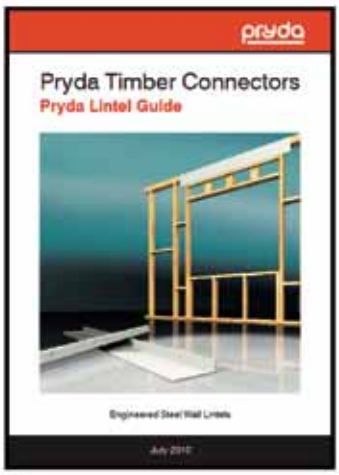


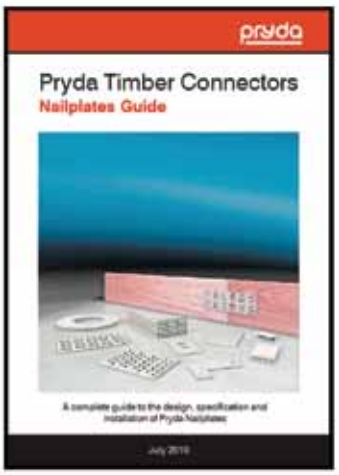


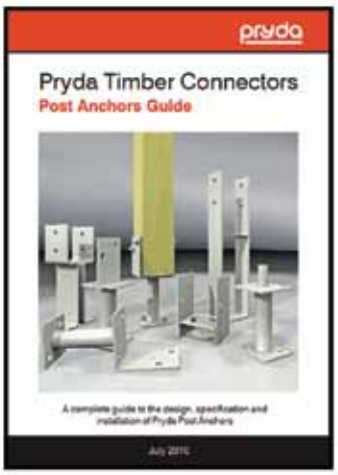












1. INTRODUCTION

Pryda has developed this guide to prefabricated trusses and frames specifically to accommodate Western Australian building practices. The prevalence of trusses and frames is growing in this state so it is important that designers, engineers, builders, inspectors and building authorities are familiar with the benefits and critical requirements of the system.

Who is Pryda?

Pryda has been an integral part of the building industry in Australia for almost 40 years, particularly in timber truss and frame solutions with the development of a diverse range of timber connectors and structural brackets. Today Pryda remains a trusted Australian brand on building sites, in trade stores and in offices of architects, engineers and designers.

Pryda utilises world-best technology to provide a total systems package to its licensed truss and frame plants, including fully integrated software and production systems, access to world leading manufacturing equipment, and the highest levels of technical support.

The Company

Pryda Australia is an autonomous division of USA-based Illinois Tool Works Inc. a Fortune 200 diversified manufacturing company with more than 90 years of history. Other successful brands in the ITW stable include Paslode, ITW Buildex, Ramset and Reid Construction Systems. Pryda also gains valuable benefits in product, fabrication machinery and software development from its association with other ITW software and truss connector suppliers from around the world.

The Philosophy

Pryda develops customer solutions based on the philosophy, ***"identify the need, understand the problem, and develop the best solution."***

Pryda's philosophy is a unique method of looking at the total business needs of its licensed truss and frame fabricators, and providing cost effective solutions that not only meet current requirements but also identify and satisfy long term goals.

2. ENVIRONMENTAL BENEFITS OF BUILDING WITH TIMBER

Climate change is one of the most important global environmental issues today. The challenge now facing countries around the world, including Australia, is how to respond to this issue.

In recent times, growing pressure to design for energy efficiency has impacted on all aspects of the building industry. Construction design can contribute greatly to maximising comfort and to minimising non-renewable energy consumption.

Timber frame buildings are now being designed to meet low energy construction standards as timber has a high standard of thermal comfort while consuming minimal non-renewable energy. A principal objective for responsible design of environmentally friendly timber construction is to minimise life cycle energy consumption.

Timber in lightweight construction is a superior material compared to manufactured material such as steel, concrete and masonry as it uses a comparatively small amount of non-renewable energy in its extraction and manufacture.

Timber maximises the efficiency of insulation materials because wood never gets cold or dissipates heat, therefore less energy is required to maintain warmth in a building, and the less energy used, the less damage to the environment.

Today timber is available with a variety of popular and very cost effective treatments that can make it an extremely durable and termite resistant building material.

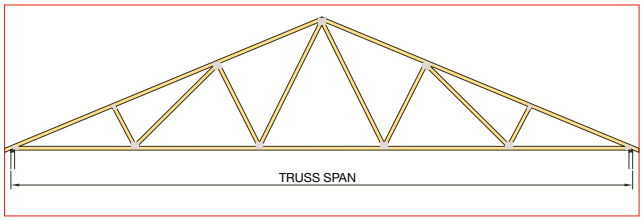
3. ADVANTAGES OF TIMBER ROOF TRUSSES

Prefabricated timber roof trusses have been part of Australian building practices for over 30 years. Builders who regularly use roof trusses claim the following benefits:

(i) Cost effectiveness
(ii) Piece of mind for building authorities & certifying engineers
(iii) Design flexibility
(iv) Ease of installation

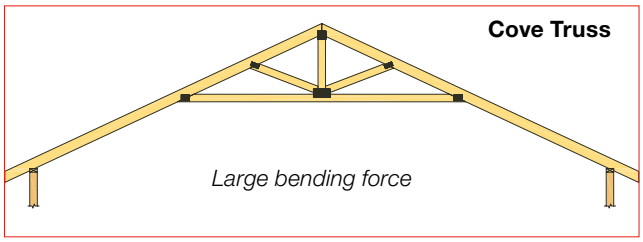
(i) Cost Effectiveness

Long clear spans can be achieved at an economical rate. Trusses can easily span 10-15 metres or more without the need for internal supports. This is particularly useful for 'open plan' designed homes.



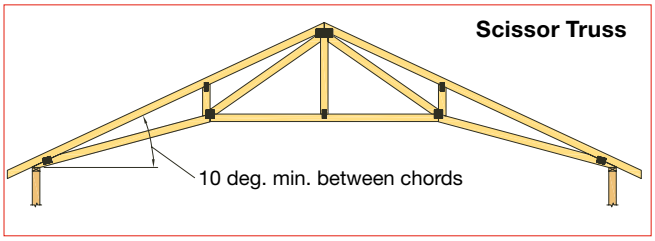
Achieving a ceiling line as shown upper right via a "cove truss" does not effectively utilise the benefits of truss triangulation and consequently results in:

- Large top chord sizes and
- Large defections



A much better and more economical alternative is to use a **Scissor Truss** which will provide the following benefits over the cove truss:

- Smaller timber sizes
- Minimal deflections
- Longer spans



Trusses are individually engineered which **optimises the timber truss components** to suit the design loads applied to them. Manufacturing of trusses optimises timber stock, leading to **minimisation of timber waste**.

There are many home designs which are conducive to roof trusses and **deliver an overall cost saving** compared to a traditional stick-built roof.

(ii) Piece of mind for building authorities and certifying engineers

There are stringent requirements associated with the development and use of Pryda's design software, Pryda Build, which delivers the associated benefits:

- Alleviates the need for designers and project engineers to prepare detailed specifications associated with the roof, floor and wall components. This can be supplied by Licensed Pryda Fabricators.
- Building authorities can often provide building consent based on the documentation supplied by the Licensed Pryda Fabricators without the requirement for independent third party certification, particularly in residential construction.

Scope of use

Pryda Build is used by Licensed Pryda Fabricators to produce designs and manufacturing specifications for joined and unjoined timber and steel components in the construction of residential and light commercial and industrial structures. All timber components and connectors are individually designed to suit the specific loading conditions for the structure.

Independent Engineering Assessment

Pryda Build has been independently assessed by professional consulting structural engineers for compliance with the Building Code of Australia, BCA 2010, and its referenced documents.

Pryda has also demonstrated compliance with the requirements set out in the ABCB Handbook "The Use of Structural Software for Building Design Approval" (2007).

Software referenced documents

Pryda Build implements the requirements set out in the Building Code of Australia, BCA-2010, and the following referenced documents:-

AS/NZS 1170 Structural design actions
Part 0: 2002 General principles
Part 1: 2002 Permanent, imposed and other actions
Part 2: 2002 Wind actions
Part 3: 2003 Snow and ice actions

AS 1649 - 2001 Timber - Methods of test for mechanical fasteners and connectors - Basic working loads and characteristic strengths

AS 1684 Residential timber-framed construction
Part 1: 1999 Design Criteria

AS 1720 Timber Structures
Part 1: 1997 Design methods

AS 4055 - 2006 Wind loads for housing

AS/NZS 4600 – 2005 Cold-formed steel structures

Software User Requirements
All users of Pryda Build are required to have undertaken a formal training course in the use of the software. This training is provided by Pryda and takes the form of group training courses at centralised locations, and/or one-on-one training at a Licensed Pryda Fabricator's premises.

Pryda organises intensive training programs for Pryda Build on a regular basis. Initial courses are for 3-days at centralised locations around Australia and New Zealand. At the completion of this course, attendees are able to install and operate Pryda Build. Training must be completed prior to installation of Pryda Build

Users are issued with a Certificate of Training if they have demonstrated an acceptable understanding of the features presented during the course. Evidence of this training to any fabricator using Pryda Build may be obtained on request.

Documentation supplied by Pryda Licensed Fabricators
The following reports are available and they can each be produced by a truss fabricator using the software:

- **Producer Statement Report** – a statement of design compliance for the whole job with overall and nominal design criteria, and BCA referenced documents.
- **Plan Layout** - showing the roof and all trusses laid out; all bracing (input by users); special notes for installation; all truss-to-truss connections
- **Detail Sheet** – a drawing of each truss with all relevant design parameters associated with that particular truss
- **Design Report (summary)** – all general loads; all applied distributed loads; truss serviceability displacements for major loads; support reactions; critical member timber designs details; bearing requirements; and nailplate design details at critical joints
- **Design Report (detailed)** – as for the summary report, plus the results of the analysis for the 4 most critical combined load cases; all timber member designs; all nailplate joint designs

Pryda Australia
A division of ITW Australia Pty Ltd (Engineering),Ph (03) 9554 7001 Fax 9554 7000
ABN:

Date: 18-11-2010
Pryda Build V 3.0.0.652

Producer Statement

Job Ref: **6-800**

Truss Design Criteria For Building Permit Application

CLIENT Name:

SITE Details:

Address :

City:

Post Code: State:

Nominal Design Criteria:

Building importance: Residential
Roofing: Sheet steel (0.48mm)
Ceiling: 10mm plasterboard
Top chord purlins: 900 mm

BC restraints: 600 mm
Standard truss spacing: 600 mm
Standard roof pitch: 27.00 deg.
Ult. design wind speed: 40 m/s (wind classification = N2)

Max. eaves height: 6 m
Max. ridge height: 8 m

Int pressure coeff. up: 0.2
Structural Fascia: Not required except at hip corners

Note: The standard trusses in this job have been designed for wind conditions assuming a fully hipped (or Dutch hip) roof.
Note: Some trusses in this job support roofing and ceiling materials that are different to this nominal data (see individual truss detail sheets).

The truss designs for this job have been determined using computer software provided by Pryda Australia, using sound and widely accepted engineering principles. In particular, loadings and designs are performed in accordance with the Standards adopted by primary reference in the Building Code of Australia, BCA 2010, Volume 1, Specification A1.3 and Volume 2, Part 1.4.

In addition, the following secondary referenced Australian Standards also apply:

AS 1649-2001	Timber - Methods of test for mechanical fasteners and connectors - Basic working loads and characteristic strengths
AS 1684.1-1999	Residential timber - framed construction, Part1, Design Criteria

The software used in the preparation of these designs complies with the ABCB Handbook, "The Use of Structural Software for Building Design Approval" (2007), and in the South Australian Minister's Specification A2.2, "Structural engineering software" (May 2010). A copy of the Compliance Document referenced therein is held at the Pryda office in Melbourne, Australia, and is available for examination by approval authorities and other building practitioners if required.

The person signing this Statement has been trained in the use of this software (Training certificate ID:).

All trusses shall be manufactured in accordance with the fabrication specifications provided by Pryda, and installed, connected and braced in accordance with the recommendations given in - : AS4440:2004 "Installation of nailplated timber roof trusses" and any other supplementary details that may be provided, such as the Pryda Installation Guides.

All truss designs and their connections have been designed using Pryda design software. Additional items such as roof/ceiling plane bracing, special notes, supplementary timber, etc., which may be shown on the plan drawings are the responsibility of others.

Name: _____ Position: _____

Signed: _____ Date: 18-11-2010

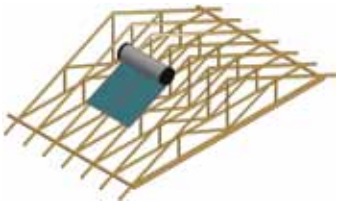
(iii) Design Flexibility

- In most cases the design and layout of trusses can **easily accommodate air conditioning units, hot water systems, skylights and other roof features**.
- Trusses can **accommodate a variety of architectural specifications** – such as coffered ceilings, box gutters and raked ceilings.

Trusses designed to accommodate a Coffered Ceiling

Trusses designed to accommodate a Scissor Ceiling

Trusses designed to accommodate Box Gutters



Trusses designed to accommodate a Hot Water Unit

(iv) Ease of Installation

- **Installation times are reduced** by trusses being delivered to site ready to install.
- Unlike materials supplied on site for stick-built construction, trusses are designed specifically for each job, thereby **reducing the prevalence of material theft**.
- Trusses are made in precision jigs to ensure **uniformity of roof planes**.
- **A truss roof is supplied as an entire package** as distinct from stick-built roofs supplied by different suppliers. i.e. steel beams, LVL beams and timber roof framing. This also provides scheduling benefits.
- Manufacture of trusses is undertaken off-site so **work progress**, other than final installation, **is not limited by site conditions** (i.e. weather conditions; or limited space for 'cutting out' on small sites and multi-residential sites).

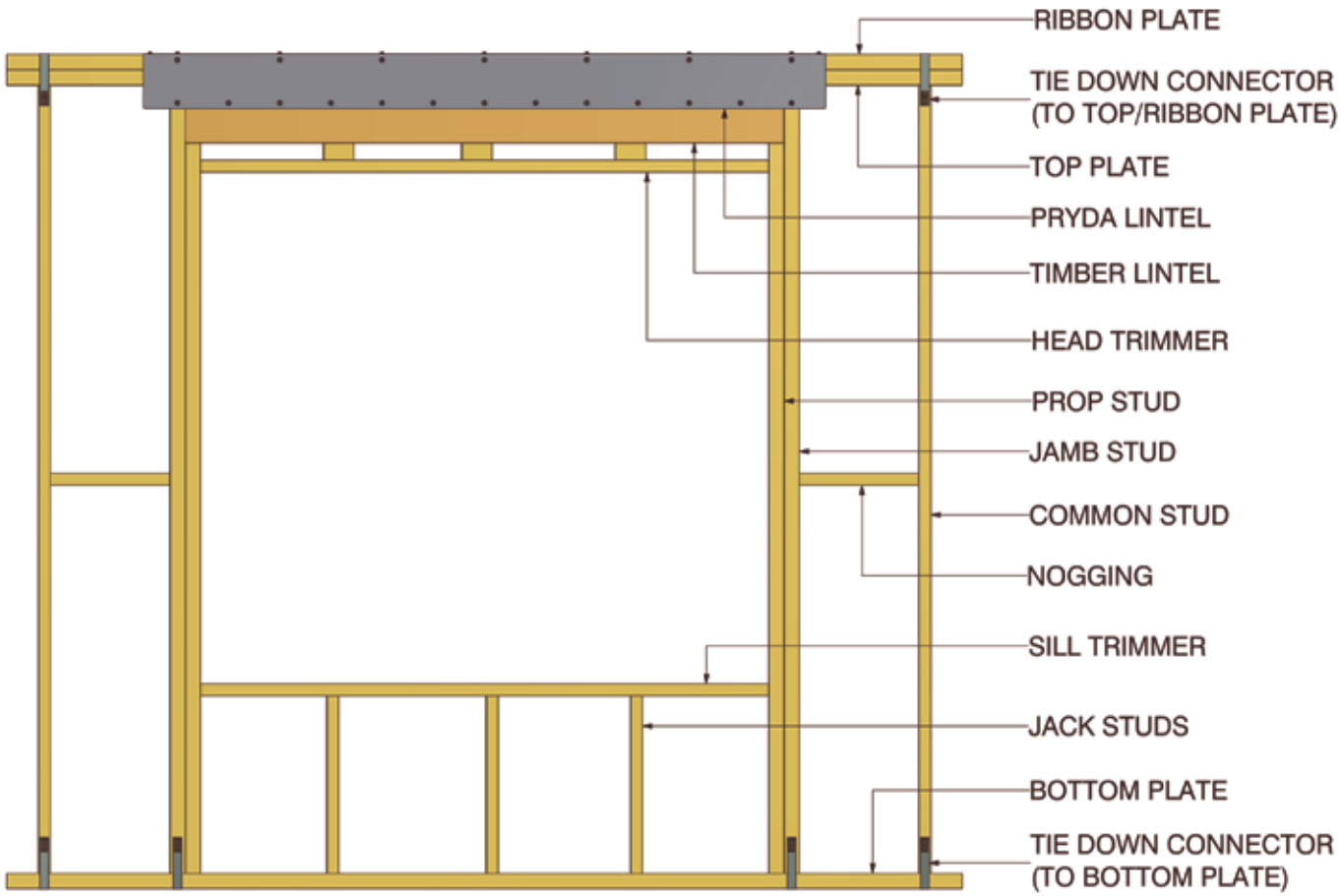
Trusses are design specific for each house so it is uncommon for trusses to be stolen from site. They are often delivered to site and stacked on top of the wall frames.

Trusses are made in precision jigs so there is uniformity of the roof planes

4. BENEFITS OF PREFABRICATED TIMBER WALL FRAMES

Prefabricated timber wall frames offer many of the benefits associated with timber roof trusses. Furthermore a combination of timber frame and lightweight cladding can deliver further benefits including reduced costs, improved energy efficiency and a greater contribution to sustainability.

Components of a timber wall frame



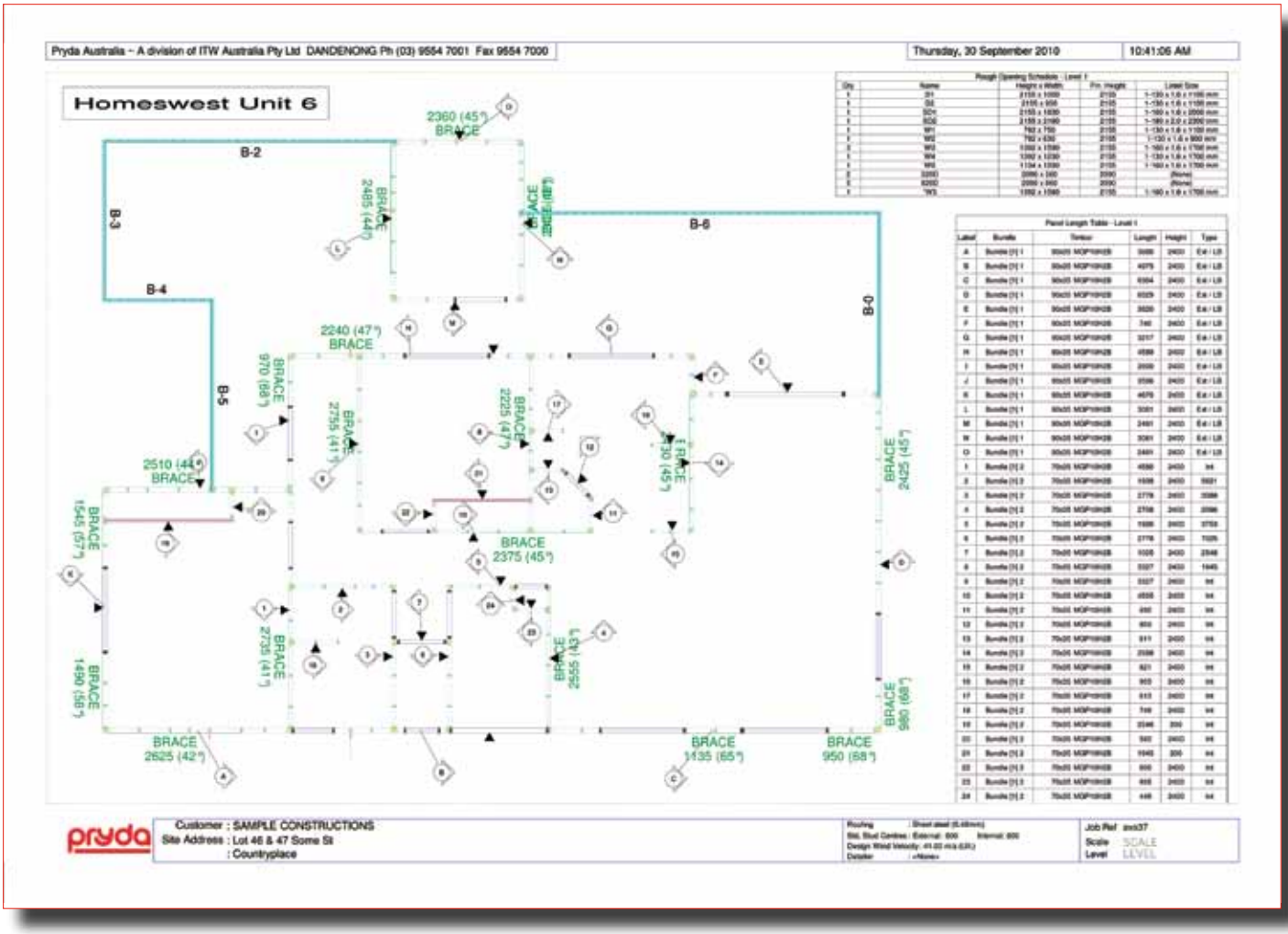
a. General Benefits of Prefabricated Timber Wall Frames

(i) Cost effectiveness

Prefabricated timber wall frames are manufactured off-site in a factory environment using state of the art software and manufacturing equipment and are delivered to site ready to install with clear installation instructions. The reduced on-site erection times lead to significantly reduced labour costs.
Prefab frames can also reduce the effect of wet weather delays.

Frames are individually detailed and engineered which **optimises the timber components** to suit the design loads applied to them.

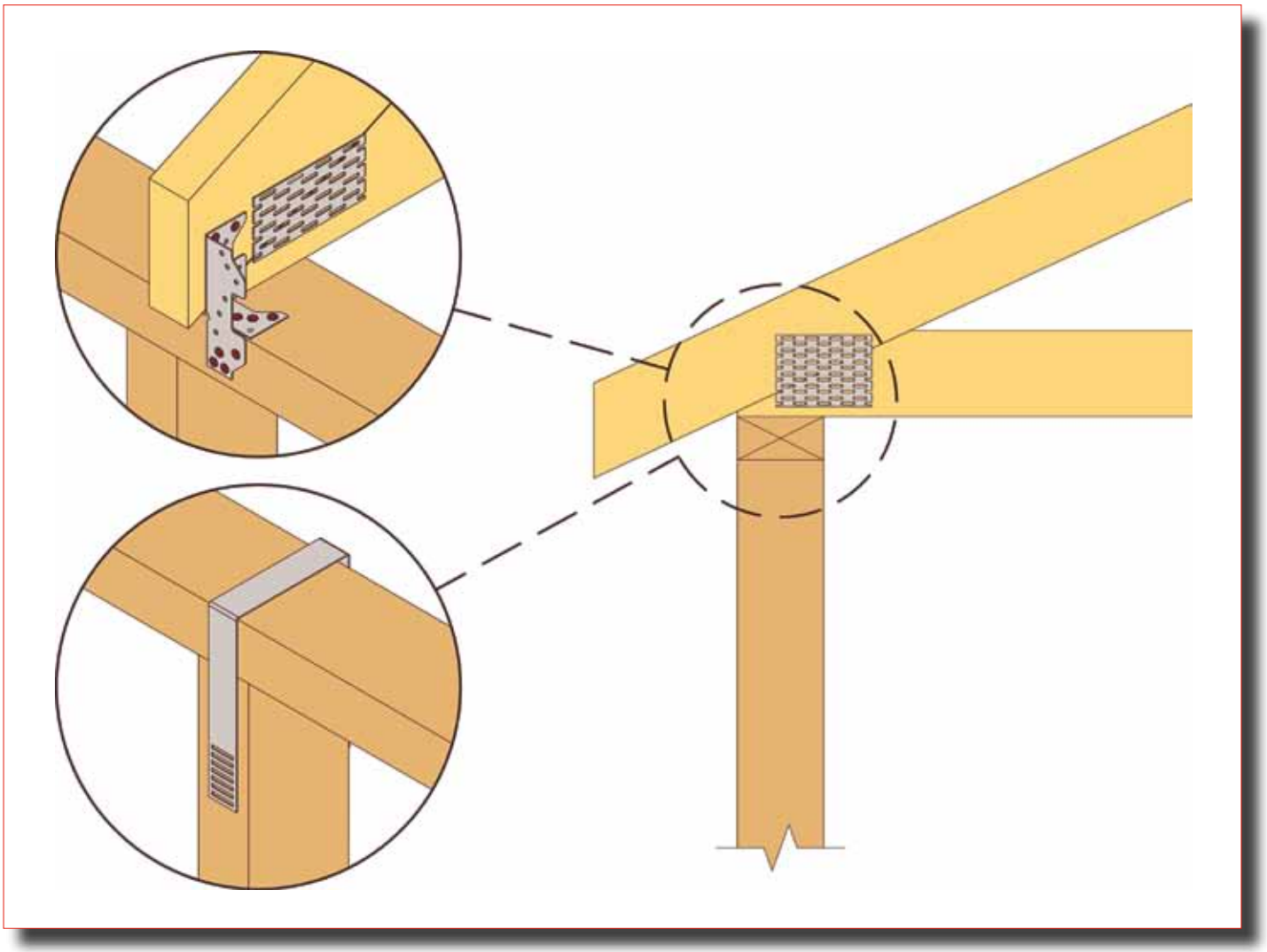
Manufacturing of frames optimises timber stock, leading to **minimisation of timber waste** versus the on-site stick built alternative.



(ii) Piece of mind for building authorities and certifying engineers

As part of a fully engineered system, the Licensed Pryda Fabricator will ensure that the critical studs, wall plates, lintels (steel or timber) and various tie downs and restraints are designed to support the roof and upper storey loads.

More importantly, the 'right hand is guaranteed to be talking to the left hand' with one entity (the fabricator) overseeing the design and manufacturing of the entire system.



(iii) Versatility of timber during construction

Timber is a material that all builders are familiar with and comfortable using. This provides for flexibility on site when foundation errors exist or last minute changes are required.

(iv) One-stop-shop solution

Pryda Licensed Fabricators can provide builders with their complete roof and wall framing requirements as part of a fully engineered system including lintels and beams.

b. Benefits of Prefabricated Timber Wall Frames with Lightweight Cladding

Many buildings in Australia use the construction method of timber frames with cladding. However, buildings in metropolitan Perth are different. The walls are typically built in double brick. This also differs from the rest of Western Australia, where construction methods are similar to the rest of the country.

A booming Perth housing market has increased the pressure for faster, more affordable construction methods and some Perth builders are actively exploring ways to build that don't involve double brick.

Image Source: The Smarter Construction Book, James Hardie, 2008

(i) Cost Competitiveness

Using James Hardie® cladding or weatherboards for example, provides flexible design options with a host of other benefits. In James Hardie's The Smarter Construction Book they conduct a study on 'What's the Cost of Your Wall?' The research reveals that fully clad lightweight homes are generally just as cost competitive as the brick veneer ones. They are particularly competitive when compared to brick veneer with applied finishes or double-storey houses. In fact, using texture-coated and painted HardieTex™ base sheet is about 80% of the cost of face brick veneer for a single storey home, and even less if the brick is rendered.

Using heavy weight materials in set-back upper storey construction usually means using more structural steel than if the upper wall was built using lightweight materials. Using lightweight cladding materials can potentially reduce the structural steel, lintels, scaffolding and therefore painting costs.

Other benefits include:

(ii) Fewer Trades are Required

When building with lightweight cladding and weatherboard products, the only people you need are the carpenter and the painter. It also reduces the issues associated with **wet weather** when bricklayers prefer not to work in these conditions.

(iii) Streamlined Construction Process

The streamlined construction process and fewer trades are also a **big speed driver**. Block or brickwork introduces sand, cement, scaffold and waste with the associated logistical complexities, particularly on tight sites in medium density areas.

(iv) Simple Installation

Instead of laying bricks, rendering, scoring and painting – with all the associated mess and scheduling of different trades – cladding achieves this look without the fuss.
It is a simple installation method.

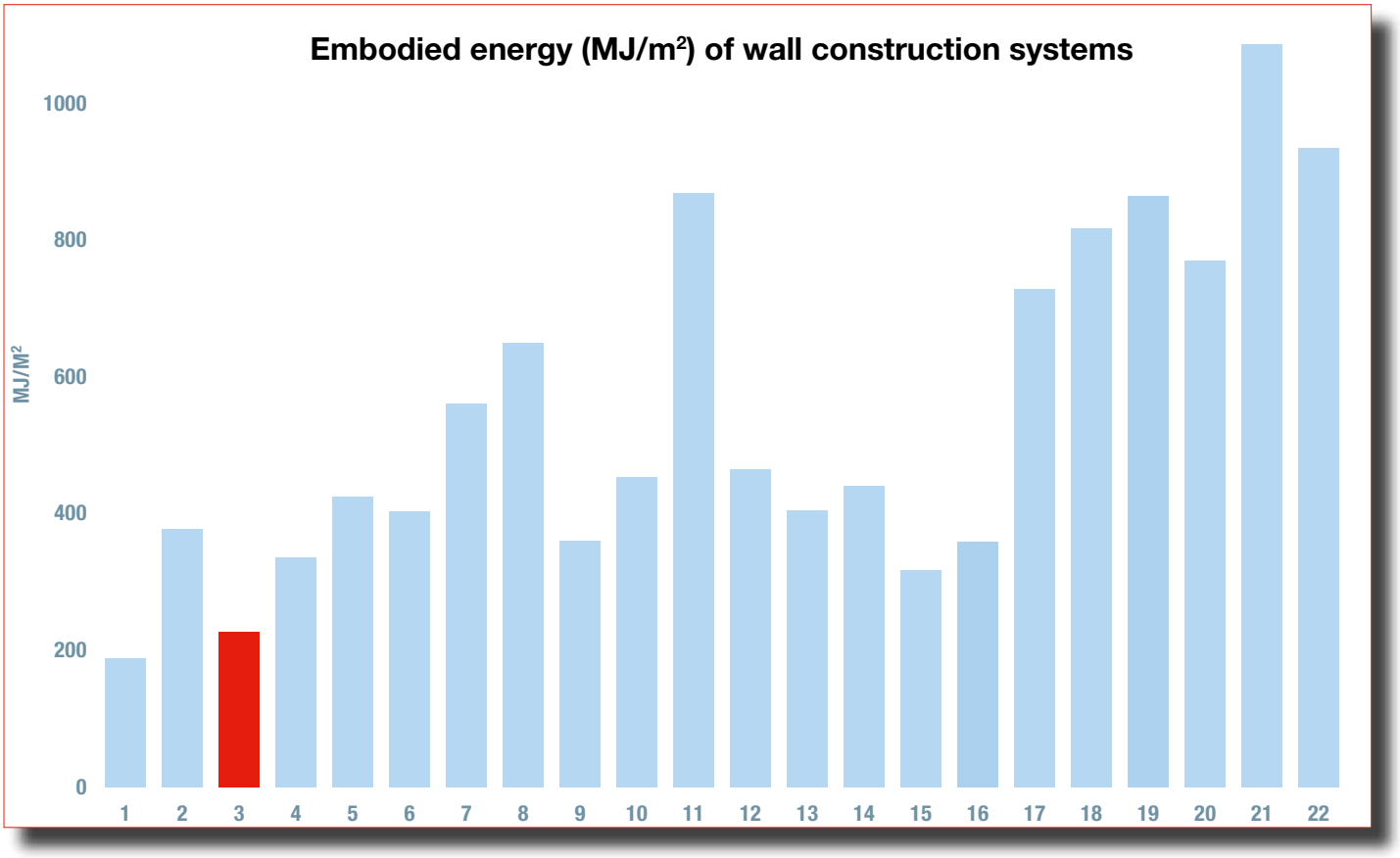
Image Source: The Smarter Construction Book, James Hardie, 2008

(v) Thermal Ratings Are Easily Achieved

Framed construction and lightweight cladding can make it easier to achieve the necessary thermal ratings for the Perth climate.

(vi) Environmental Benefits

The environmental effects of building huge houses that use vast amounts of energy are measurable and alarming. Embodied energy is the energy consumed by all of the processes associated with the production of a product. CO2 emissions are highly correlated with the energy consumed in manufacturing building materials. The embodied energy of a fibre cement clad timber-framed wall systems can be up to 60% lower than a clay brick veneer wall.



		MJm²			MJm²
1	Timber Frame, Timber Weatherboard Wall	188	12	Cavity Concrete Block Wall	465
2	Timber Frame, Reconstituted Timber Weatherboard Wall	377	13	Single Skin Stabilised Rammed Earth Wall	405
3	**Timber Frame, Fibre Cement Weatherboard Wall**	**227**	14	Single Skin Autoclaved Aerated Concrete Block (AAC) Wall	440
4	Timber Frame, Steel Clad Wall	336	15	Single Skin Cored Concrete Block Wall	317
5	Steel Frame, Steel Clad Wall	425	16	Steel Frame, Compressed Fibre Cement Clad Wall	359
6	Timber Frame, Aluminium Weatherboard Wall	403	17	Hollow Core Precast Concrete Wall	729
7	Timber Frame, Clay Brick Veneer Wall	561	18	Tilt-up Precast Concrete Wall	818
8	Steel Frame, Clay Brick Veneer Wall	650	19	Porcelain-Enamelled Steel Curtain Wall	865
9	Timber Frame, Concrete Block Veneer Wall	361	20	Glass Curtain Wall	770
10	Steel Frame, Concrete Block Veneer Wall	453	21	Steel Faced Sandwich Panel Wall	1087
11	Cavity Clay Brick Wall	869	22	Aluminium Curtain Wall	935

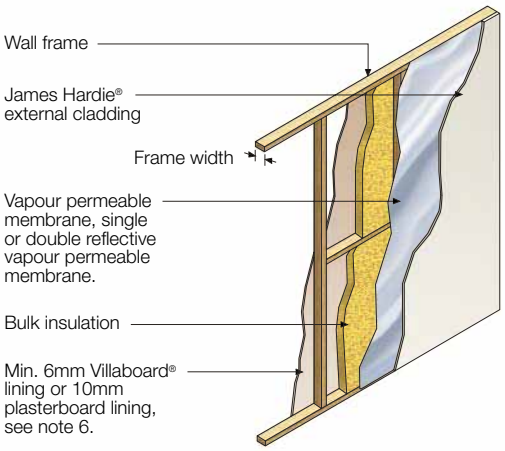
Source: Building Materials Energy and the Environment, Towards Ecologically Sustainable Development, (James Hardie "The Smarter Construction Book" 2008, Table 6.2, p59; Appendix B), Dr Bill Lawson, 1996.
The figures for fibre cement have been updated with approval of the author on the basis of the LCA study conducted by James Hardie.

(vii) Energy Efficient

A common myth is that to create energy-efficient houses, high thermal mass (brickwork) is essential. This isn't quite correct. In Perth, many builders say they prefer double brick because of its thermal properties. However, the rating results from a recent study revealed that the energy efficiency of an insulated cavity brick house and an insulated fibre cement house were virtually the same. In fact, there was evidence that the temperatures in the insulated fibre cement house were marginally cooler at night during the summer periods.

Insulation acts as a barrier to heat flow and is essential to keep your home warm in the winter and cool in summer. To compare the insulating ability of products and construction systems, look at their R-value, which measures resistance to heat flow. A guide to the R-values of systems using James Hardie fibre cement products is illustrated below:

WALL SYSTEM THERMAL PERFORMANCE TOTAL R-VALUES

WALL CONFIGURATION	Frame Width (mm)	Maximum stud spacing (mm)	Vapour permeable membrane	INSULATION: Single reflective vapour permeable membrane	INSULATION: Double reflective vapour permeable membrane	INSULATION: Bulk Insulation	Total R-value (summer or winter) m2.K/W
External cladding fixed direct to frame: Scyon™ Axon™ cladding, Scyon™ Linea™ weatherboard, HardiFlex™ sheets, PanelClad® sheets, HardiTex™ system, HardiPlank™ cladding, PrimeLine® weatherboard and the D3-ComTex® facade system.							
							
Timber frame							
	70 or 90	600	✓				0.41
	70 or 90	600		✓			0.90
	70 or 90	600			✓		0.90
	70 or 90	600	✓			R1.5	1.72
	90	600	✓			R2.0	2.22
	90	600	✓			R2.5	2.72
	120	600	✓			R3.0	3.22

Source: "James Hardie The Smarter Green Book" 2007. Note: The above table must be read in conjunction with the notes outlined in the James Hardie R-Values technical supplement at http://jameshardie.com.au/rvalues

5. DEALING WITH A LICENSED PRYDA FABRICATOR

(a) Design Information

To ensure accurate truss designs and timely delivery the fabricator will liaise with the builder to obtain all of the necessary information required to design and manufacture the trusses. Some of the critical information to be validated is as follows:

- Site specific wind classification (N1, N2, N3, N4, C1, C2, C3, C4)
- Timber treatment requirements
- Preference for truss spacing
- Air conditioning and hot water system loads and location
- Wall frames – stud spacing preference, timber treatment, opening clearances
- Roof pitch
- Building dimensions

ACME Truss and Frame Company

Nailplate Roof Truss Checklist for Building Approval in compliance with AS4440-2004

Date: _____

Builder: _____

Site Address: _____ Site Supervisor: _____

_____ Mobile Phone: _____

Building Type (circle one): Residential Commercial Essential Services

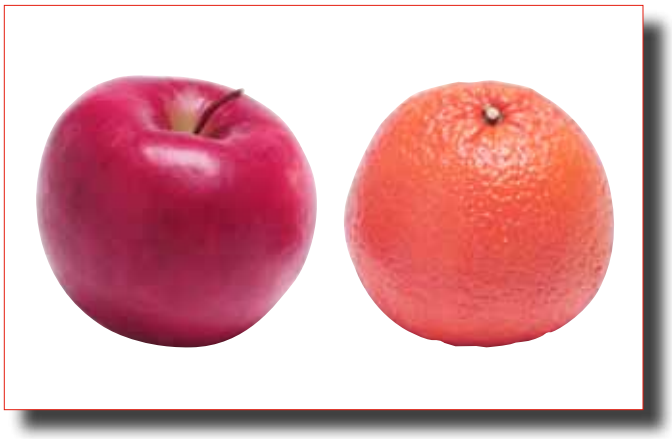
Design Criteria	Unit	Specified	Accepted
Roofing or Flooring	Material or kg/m^2		
Top chord restraint spacing	mm		
Ceiling	Material or kg/m^2		
	Material or kg/m^2		
	Batten or direct		
Bottom chord design restraint spacing	mm		
Wind classification (N1 to N4, C1 to C3)			
Internal pressure coefficient	(C_{pi}) = 0.2 or 0.7		
Truss spacing	mm		
Roof ptich Pitch 1	degrees		
Pitch 2	degrees		
Bottom chord pitch	degrees		
Truss overhang	mm		
Propped by eaves sprocket	Yes/No		
Structural fascia	Yes/No		
Special loads: Water tank	Litres or kg		
Solar system	Litres or kg		
Air conditioning	kg		
Others	kg		
Special conditions (e.g. exposure to swimming pool)			
Girder trusses: Specify type of lateral restraint and fixing:			

Name:..... Signature.....

Date:.....

(b) Comparing Quotes: Truss versus Stick-Built Roofs

Comparison of quotes between trusses and stick built frames is a subjective process.



Comparison of quotes between trusses and stick built frames can be made easier by giving consideration to the following items in the stick built quote:

- Does each quote include all necessary tie-down fixings to adequately support the roof structure from uplift for the local wind conditions?

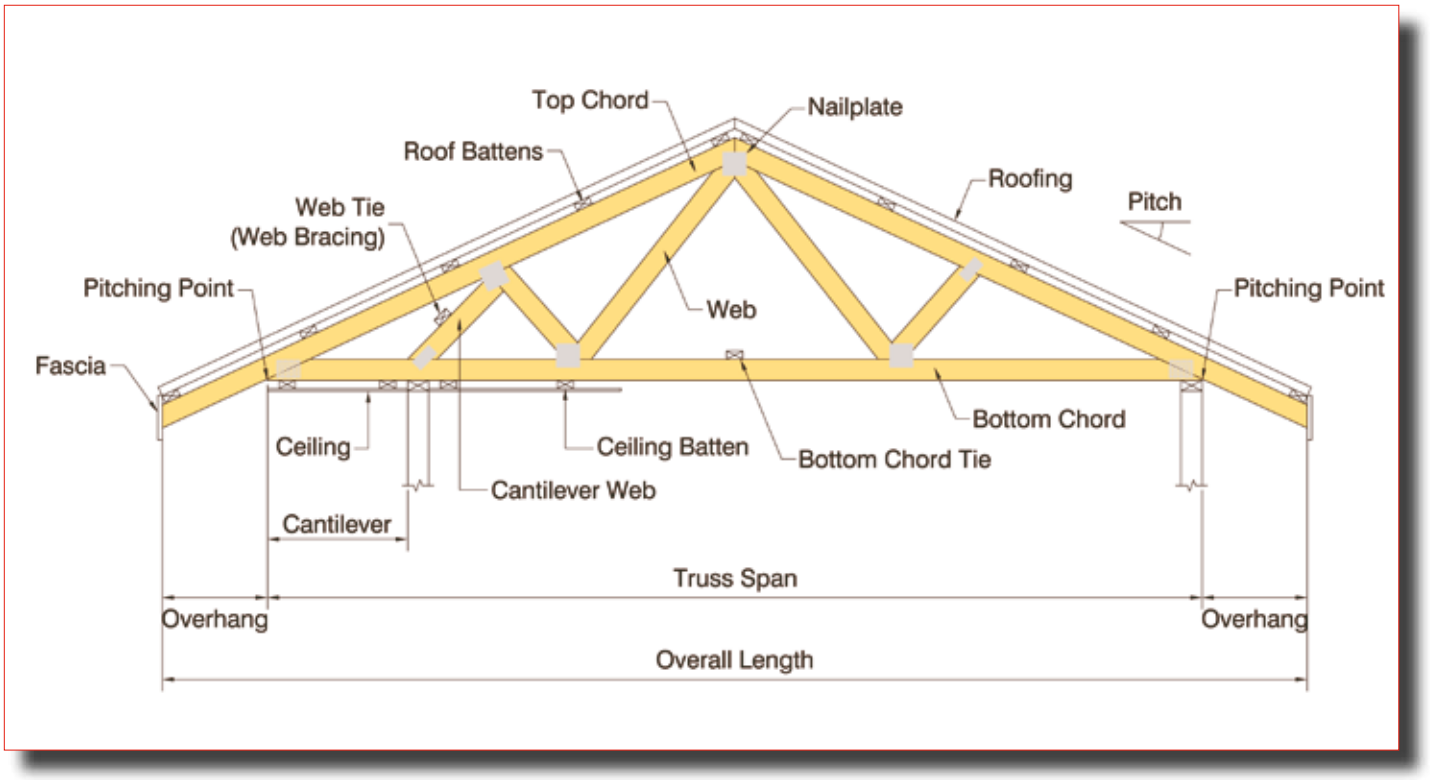
  For example, all truss quotes include fixings such as Triple Grips and Cyclone Straps. Has a similar consideration been given to rafter and strutting beam fixings to wall plates and struts?

- Has allowance been made in each quote for the support and installation of air conditioning units, solar hot water units and skylights?
- Does the stick built quote include bracing to adequately brace the roof structure?
- Is timber treatment clearly identified?
- Does each quote claim to comply with the relevant Australian standards?
- Does the stick-built quote include all elements of the roof system including strutting beams?
- Does the truss roof quote reflect considerable savings in roof truss erection against the stick-built quote?

6. ROOF TRUSSES – CRITICAL INSTALLATION CONCEPTS

(a) Truss Basics

The diagram below illustrates the typical components in a roof structure.



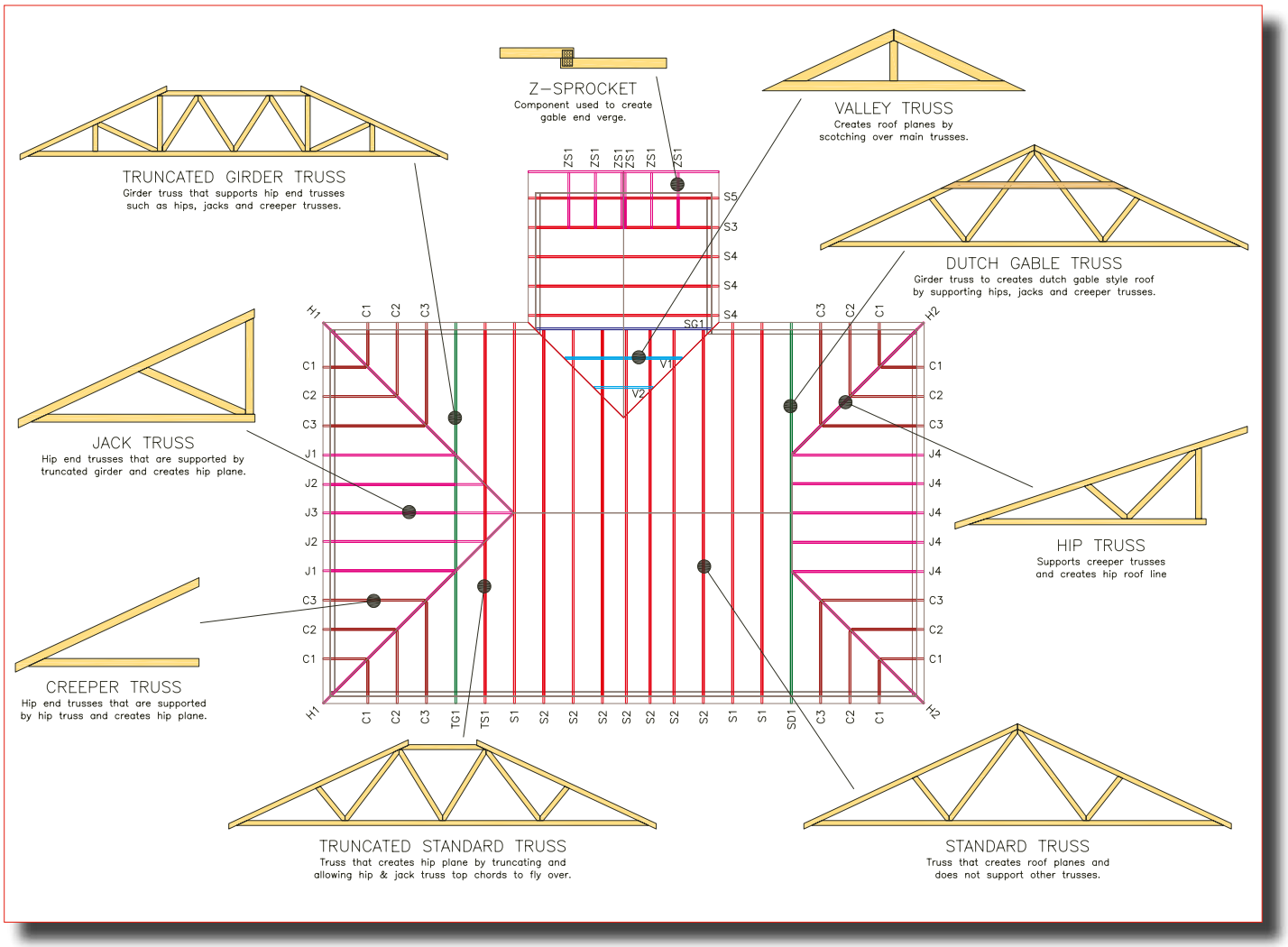
(b) Truss Layout

The licensed Pryda fabricator will provide the builder with a roof truss layout and installation guidelines. Roof trusses are individually marked to assist with the set out of trusses for each house.
Each end of the truss layout has a set-out pattern which facilitates fast and simple truss erection. e.g. hip end; gable end; dutch gable end. The layout should be referred to in all cases for correct truss identification and positioning.

The truss components are identified by a letter which typically matches the type of components in the truss.

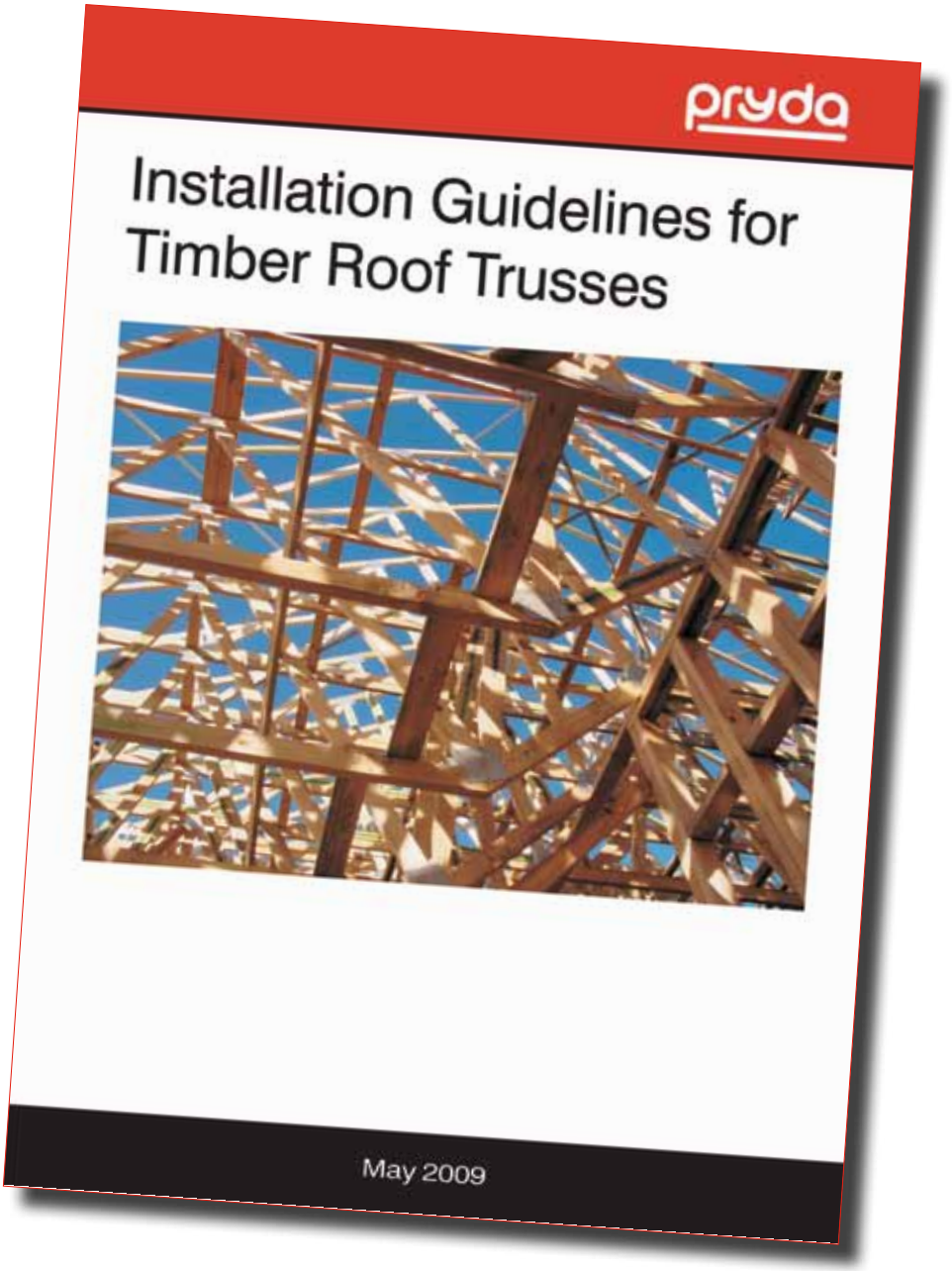
C = Creeper
H = Hip truss
J = Jack Truss
V = Valley truss
S = Standard Truss
TG = Truncated Girder Truss
TS = Truncated Standard Truss

The number that follows the letter allows identification of each truss and its position in the truss assembly.



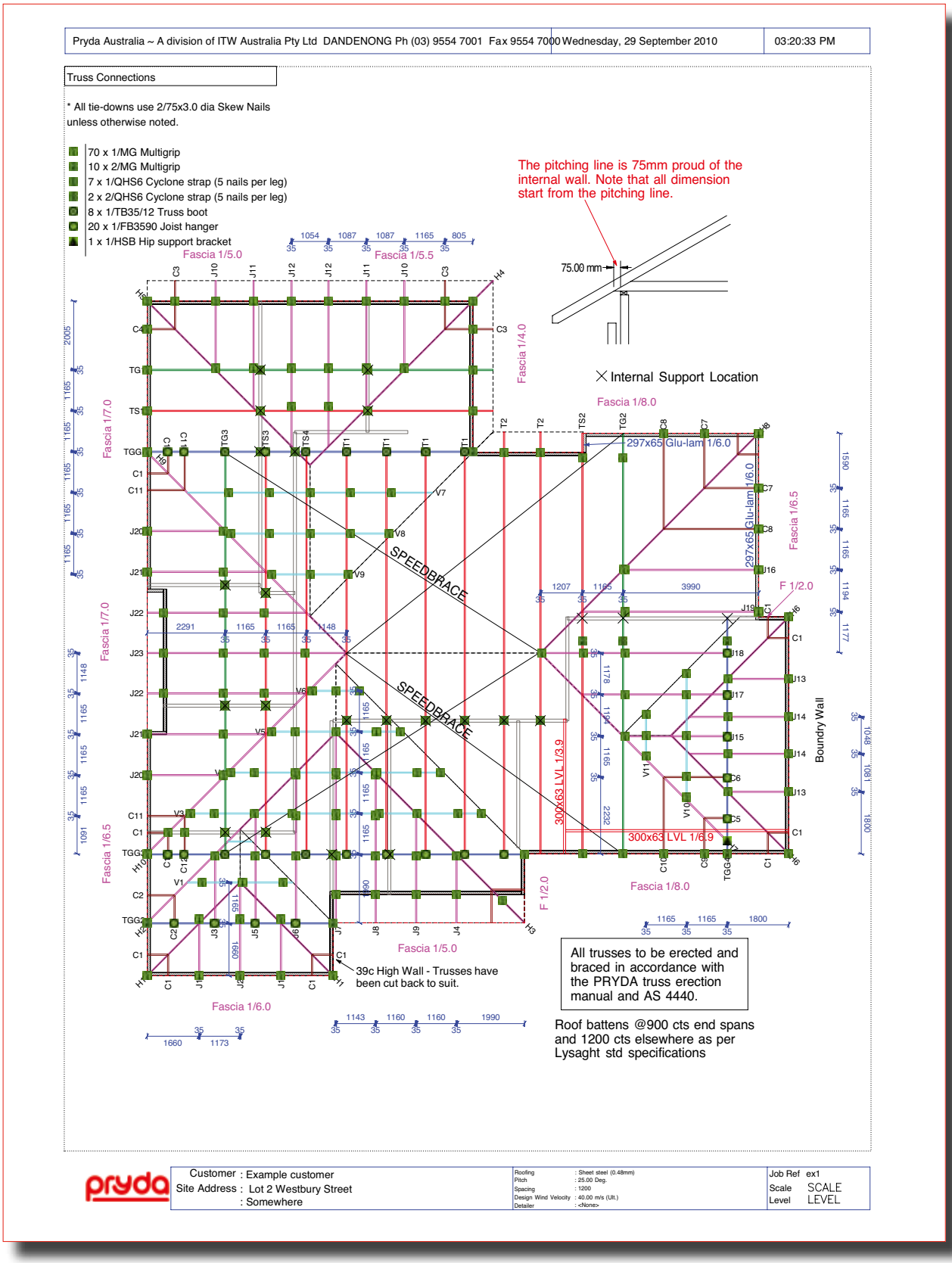
(c) Truss Installation Guides

There is an Australian Standard AS4440-2004 (Installation of Nailplated Timber Roof Trusses) that should be adhered to when installing roof trusses. It is important that the truss erector is familiar with this standard. Pryda also publishes "*Installation Guidelines for Timber Roof Trusses*" which covers most of the critical elements of AS4440 and is available on our website **www.pryda.com.au** or via a licensed Pryda truss and frame fabricator.



(d) Following the Fabricator's Layout

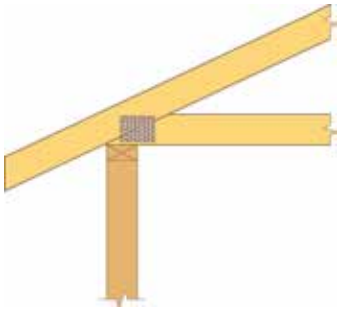
The fabricator's documentation will illustrate all the critical dimensions, location of bracing and specific fixings. If in doubt please contact the fabricator for clarification.

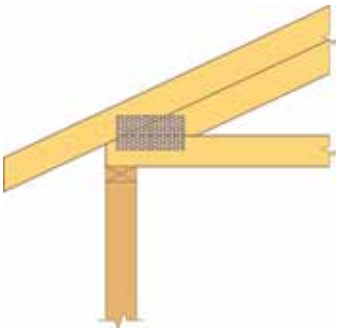


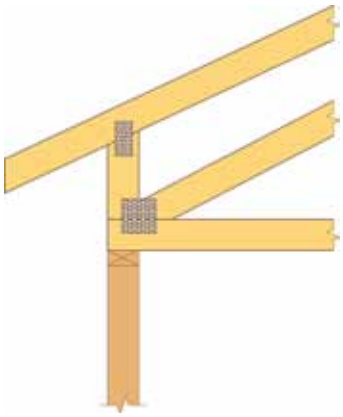
(e) Pitching Set Out Points

Adhering to the set out points noted on the layout drawing is very important with most truss roofs.

However timber roof trusses can provide great flexibility and benefits that are often difficult to achieve using conventional “stick” framing as the diagrams below show.



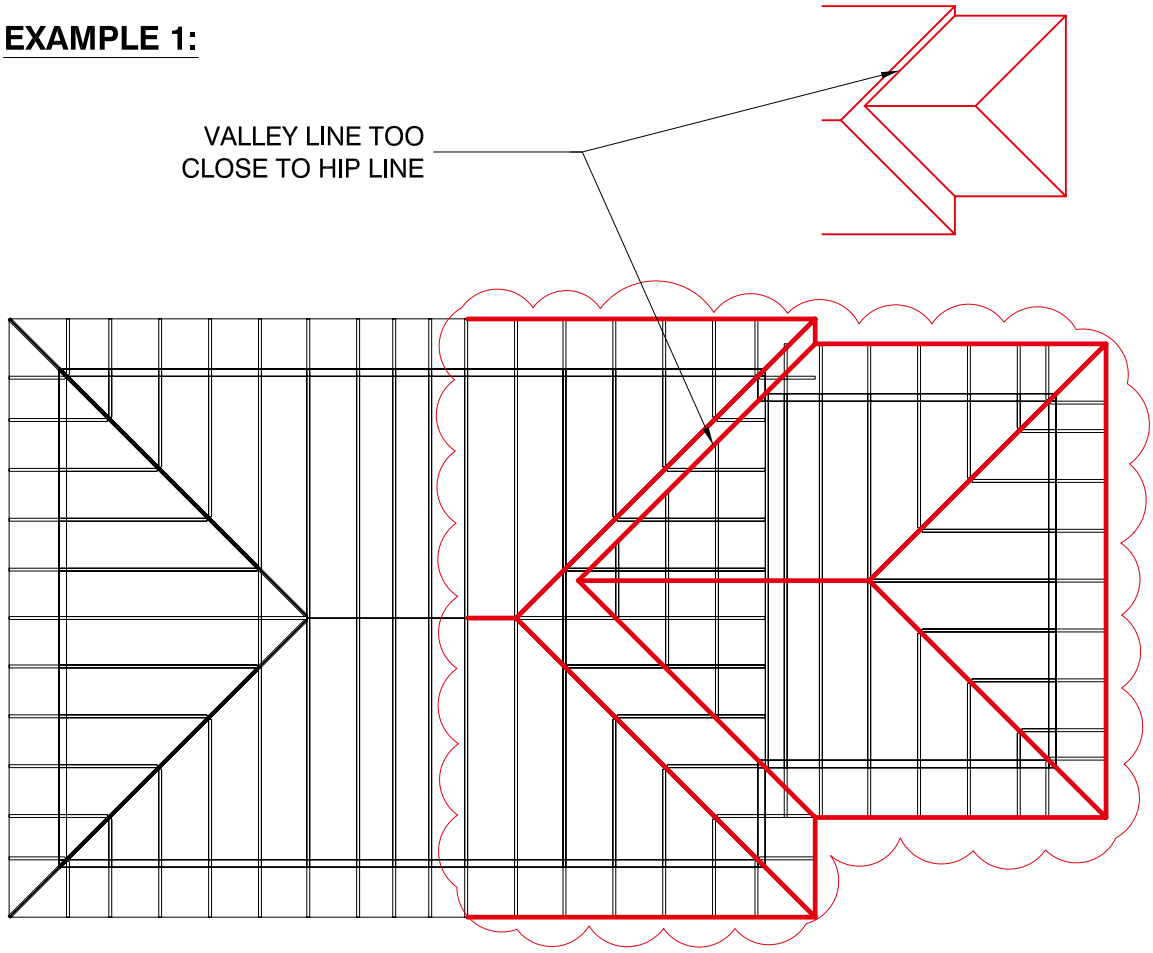




Often stick built roofs result in complicated and time consuming construction methods. In the example below the hip and valley are too close together.

This creates problems for the carpenters and in addition results in difficult roof covering installations.

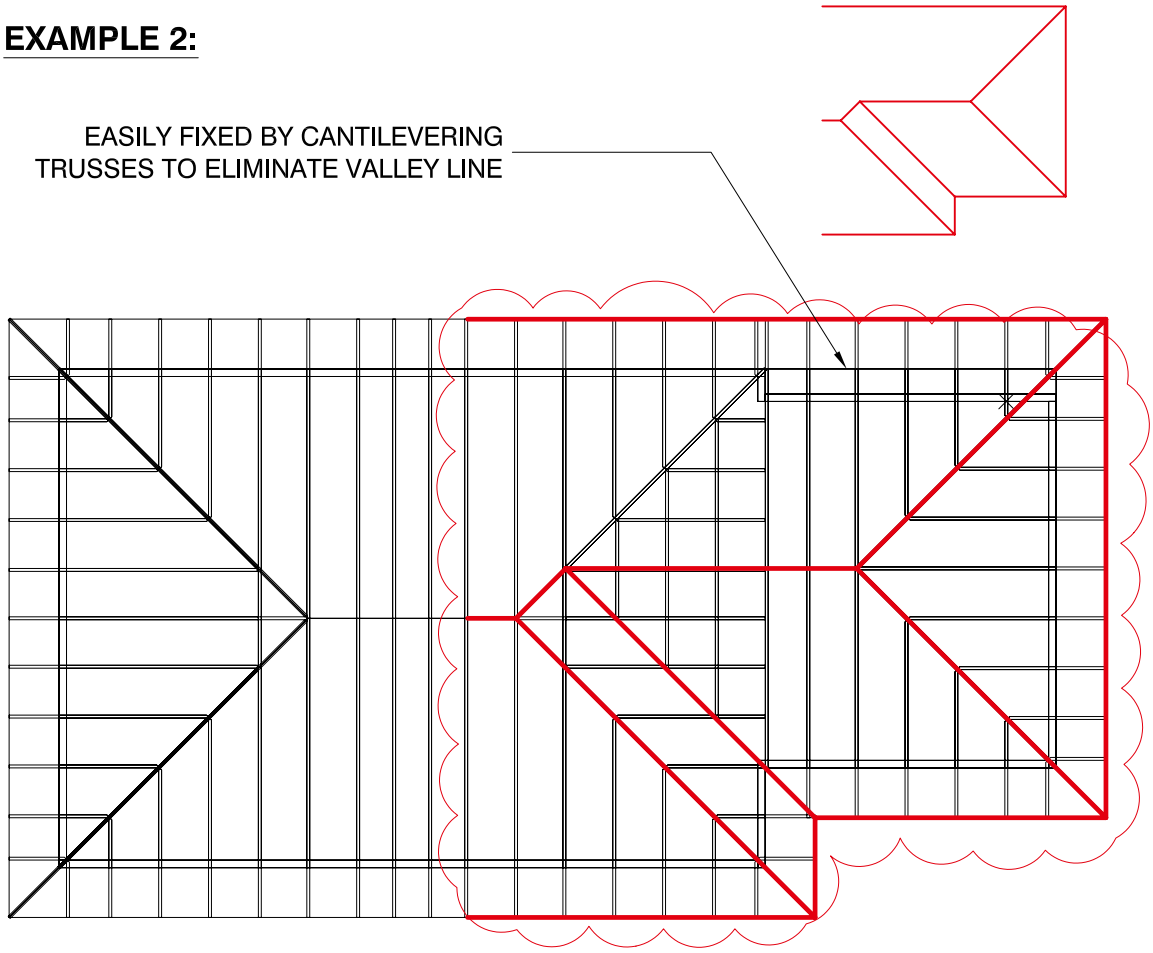
EXAMPLE 1:



The complex construction required in stick built roofs illustrated in the previous diagram can be easily overcome by cantilevering the prefabricated timber trusses. The pitching line is pushed out in line with the standard (S2) trusses, as illustrated below.

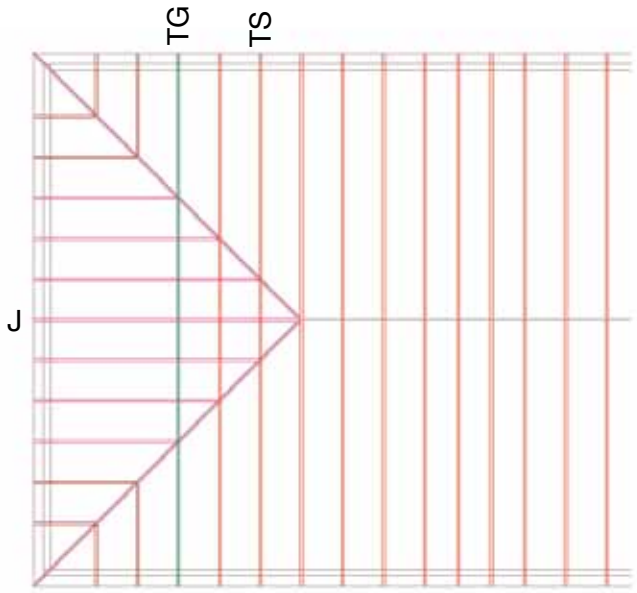
This is a relatively simple task with trusses and will provide significant cost savings over stick built construction method in the previous drawing.

EXAMPLE 2:

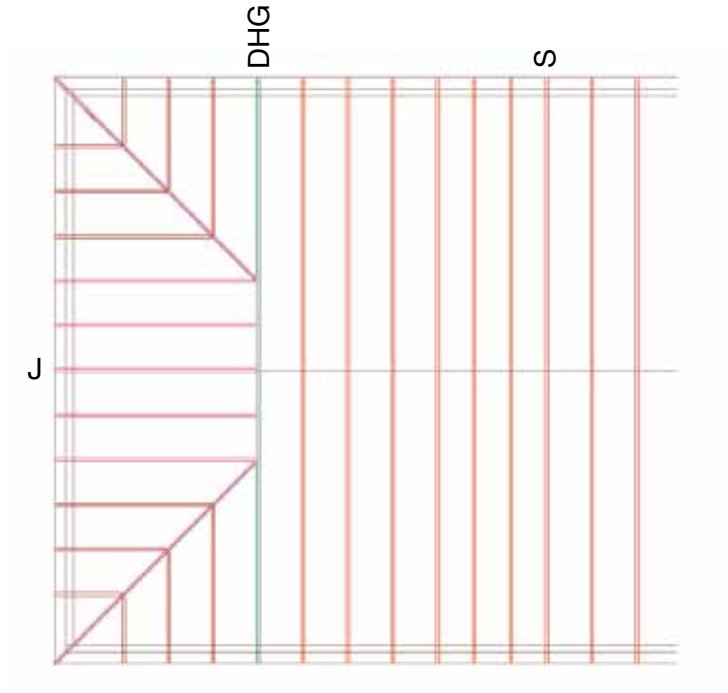


(f) Truss Erection – start with the girder and jack trusses

Typically on a hip roof the wall-plates are marked out with the heel positions of the trusses. The truncated girder (TG) is placed in position and a jack truss that sits against it and is carried by the TG is placed into position. This is generally one of the centre jacks (J) as it would normally have a top chord extension that "flies over" the TG to the crown of the roof.
The top chord extension is subsequently used to fix the horizontal top chord of the next truncated standard truss (TS) which is then placed into position and so on. This method creates a "braced end" so that the erection of the remaining trusses are stable.



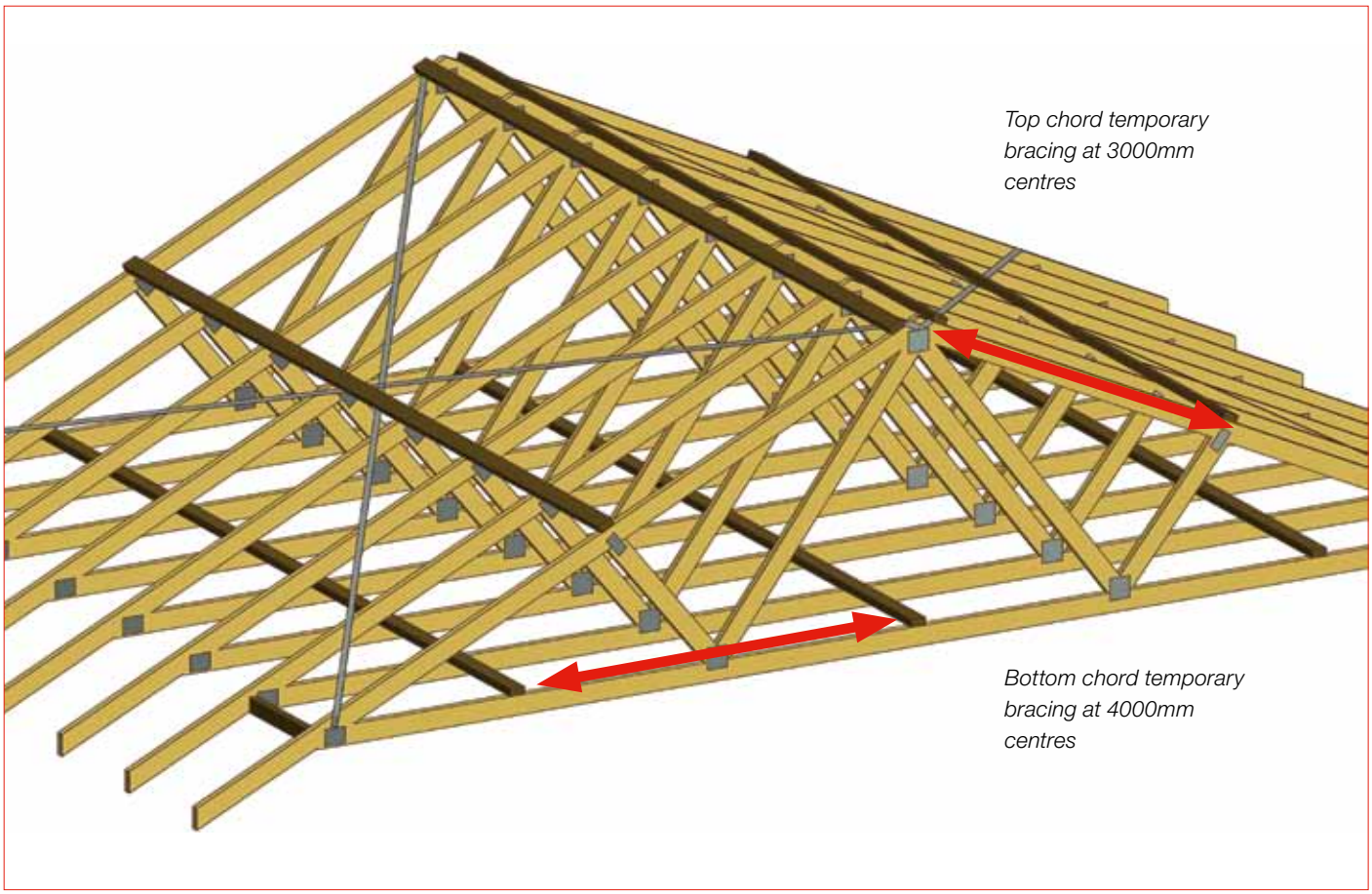
A "Dutch Gable" roof is done in much the same way by creating a "braced end" first. This generally means erecting the Dutch Hip Girder truss (DHG) and placing the jack trusses that sit against it and are carried by the whaling plate into position before erecting the remainder of the standard (S) trusses



(g) Temporary Bracing

Once the TG is located and fixed, the truncated standard trusses can be aligned and fixed to the TG with temporary bracing. This bracing should be installed in accordance with AS4440.

The requirement is for temporary bracing to be installed at 3000mm centres across the top chord and 4000mm centers across the bottom chord. 70x35 F5 or better timber should be used as temporary bracing.

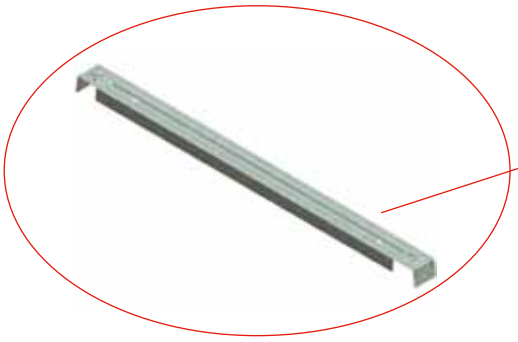


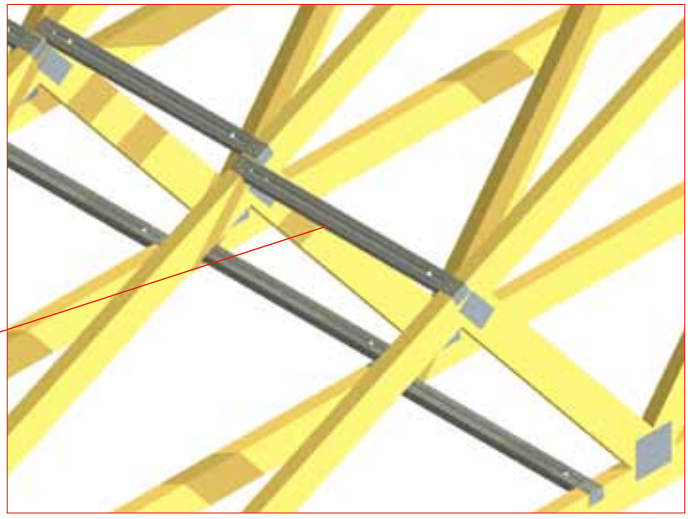
Note: If the ceiling sheet is to be suspended (e.g. with furring channels that are not directly fixed to the bottom chord of the trusses) then there is a requirement to fix bottom chord restraints in addition to the bottom chord temporary bracing.

There is also a requirement to fix speed brace to the bottom chords to complete the bottom chord bracing diaphragm. It is expected that these details will be shown on the fabricator's layout and if not, then contact the fabricator for further information.

(h) Truss Spacing

Once the TG and TS trusses are installed the standard trusses (S) can be installed at the required spacing, normally 600 or 900mm centres. To facilitate this Pryda has developed a truss spacer which allows for accurate and fast installation of trusses at standard truss spacings.

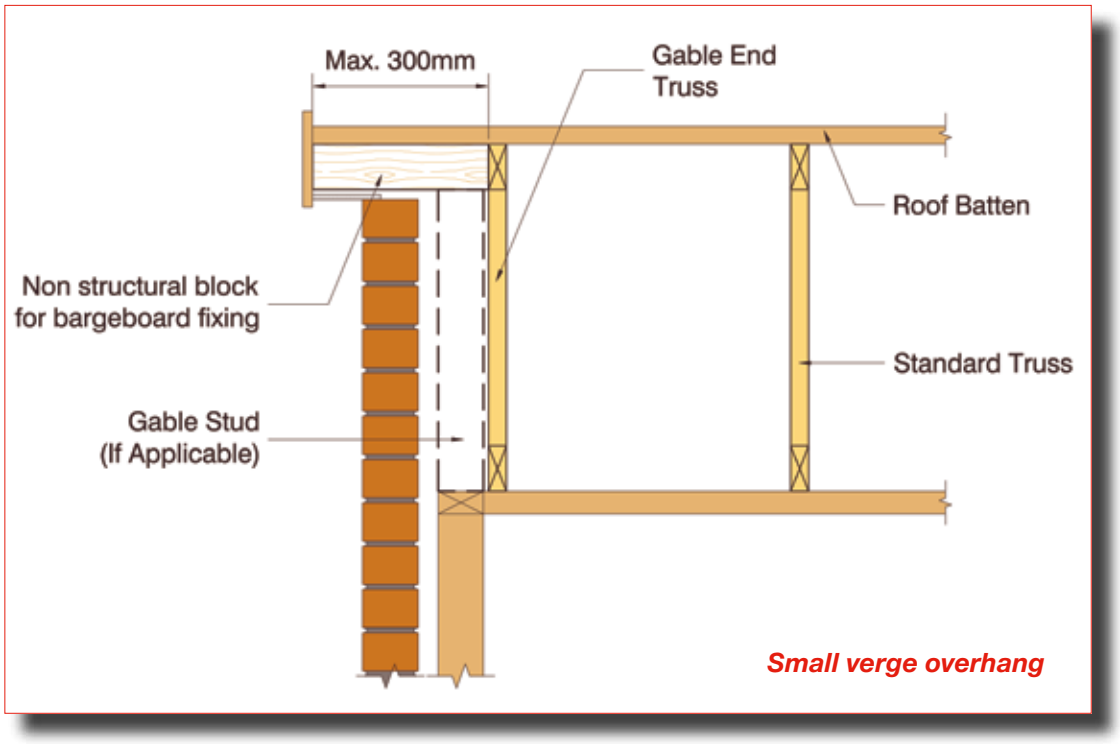


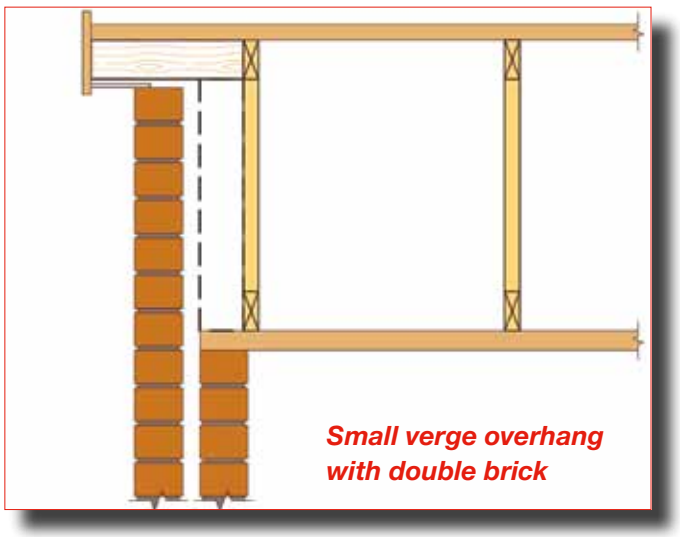


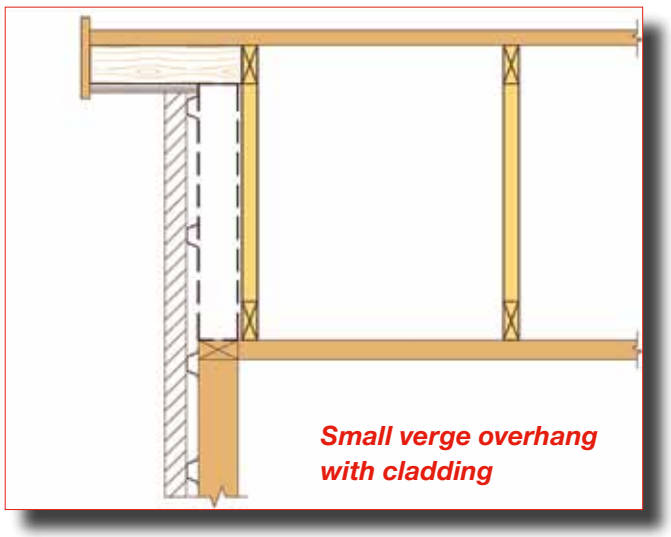
(i) Gable End Assembly

There are several methods for setting out gable ends with trusses.

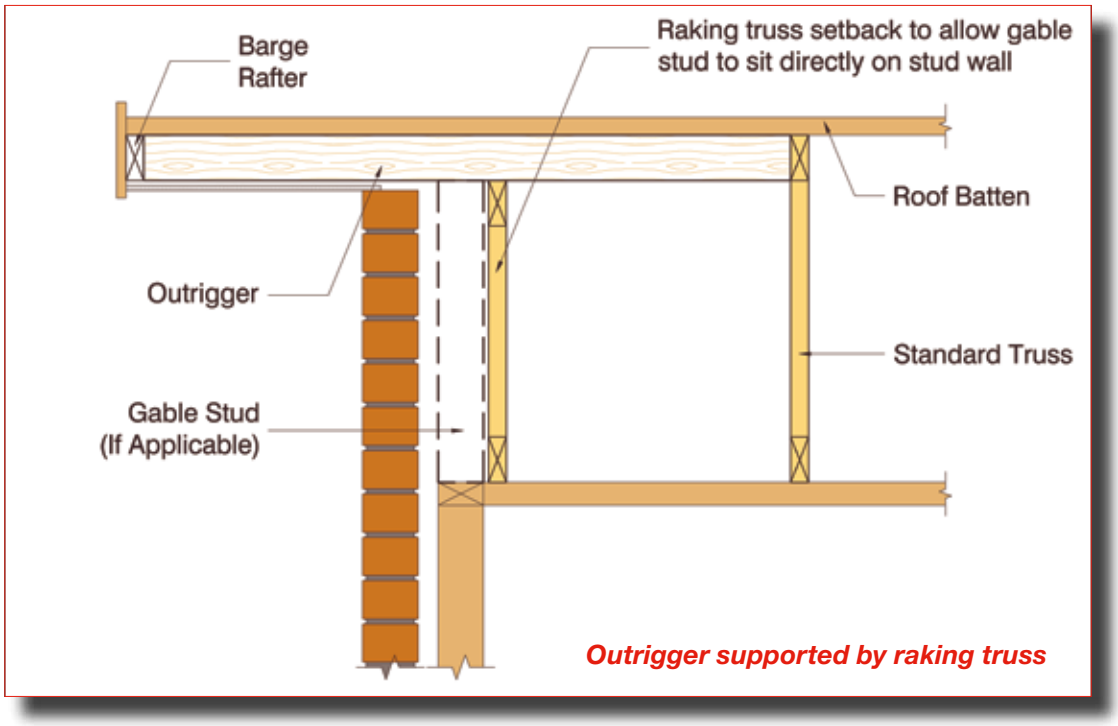
(i) Firstly the battens can be used to create the verge overhang area on the gable by extending them from the last gable end truss. This is suitable for gable overhangs up to around 300mm.



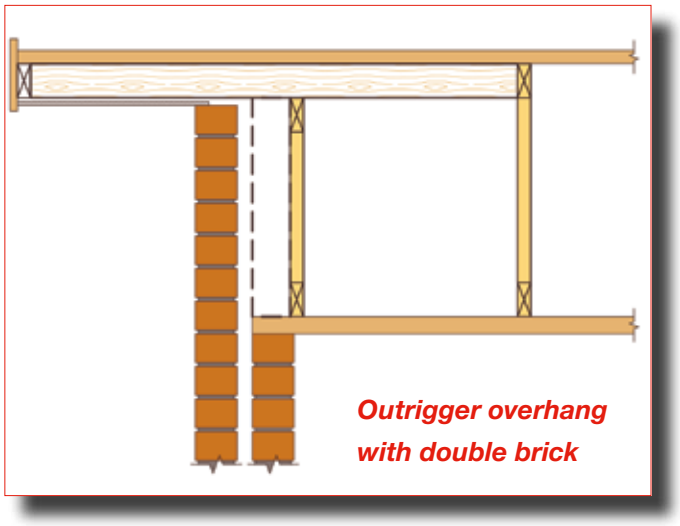




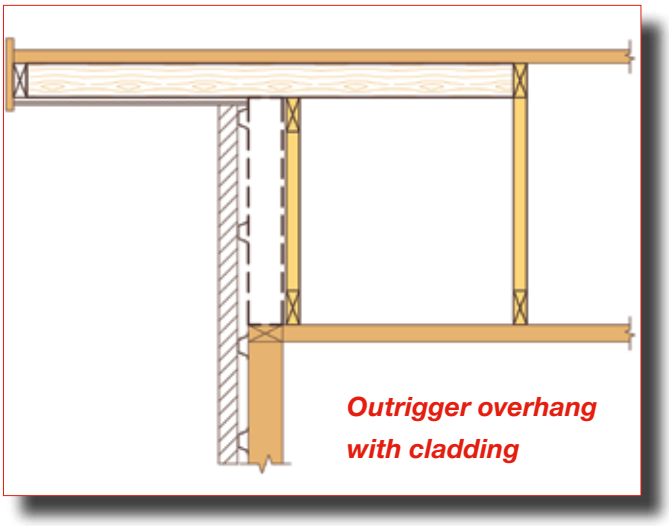
(ii) Secondly the gable end truss can be 'set down' to accommodate the use of outriggers.



Outrigger supported by raking truss

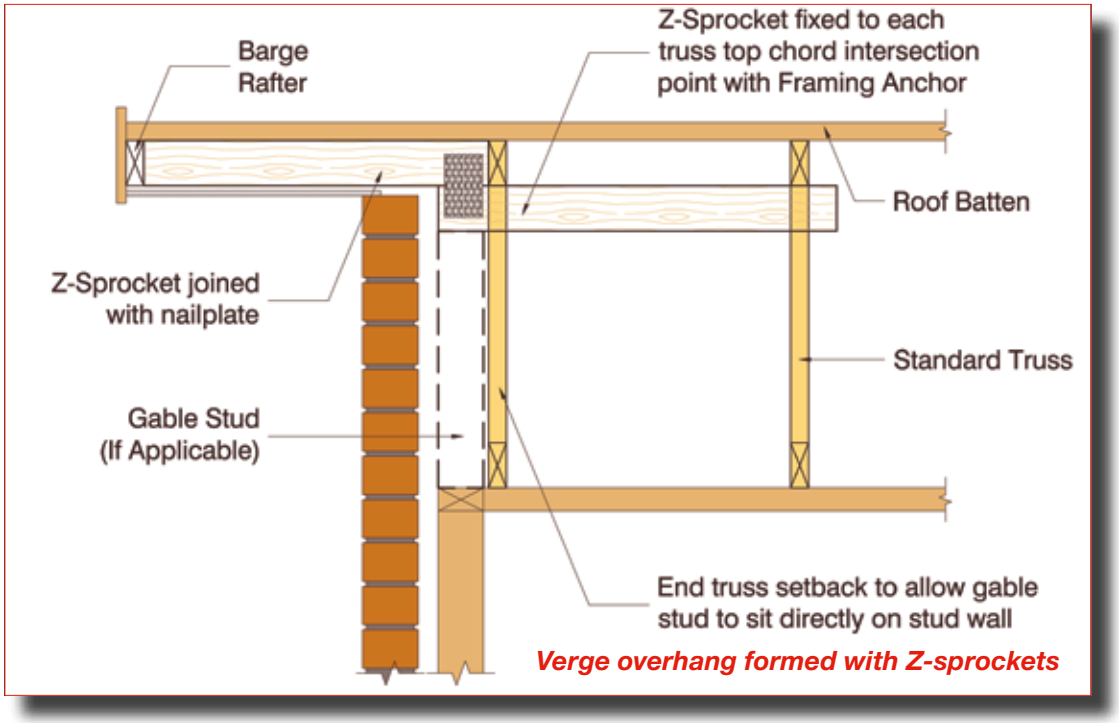


Outrigger overhang with double brick

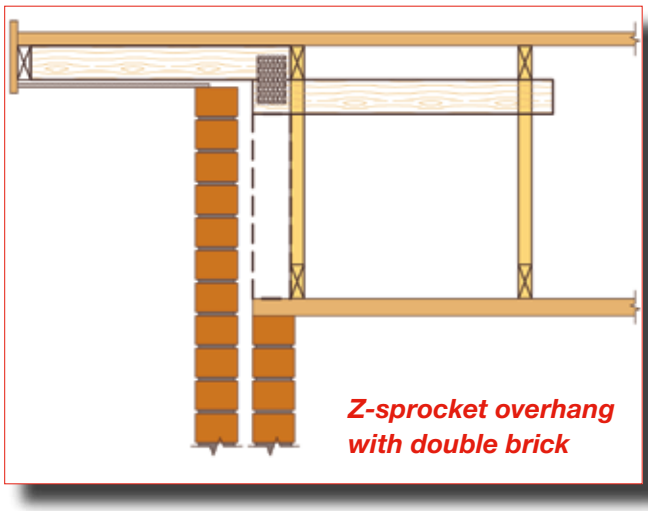


Outrigger overhang with cladding

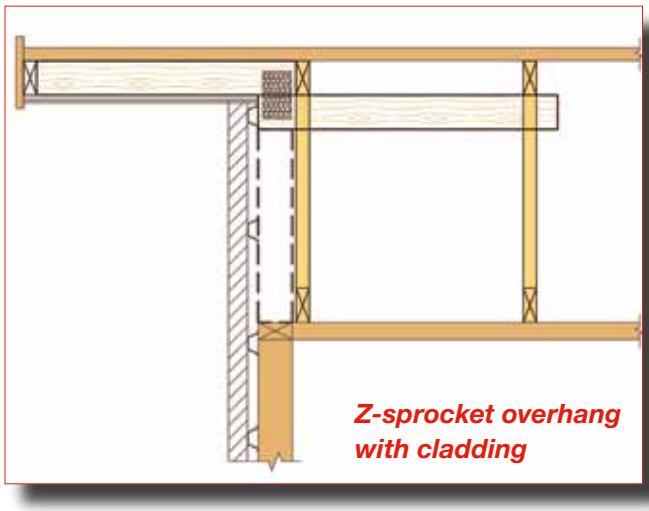
(iii) Thirdly Z sprocket outriggers can be used to form the gable overhang.



Verge overhang formed with Z-sprockets



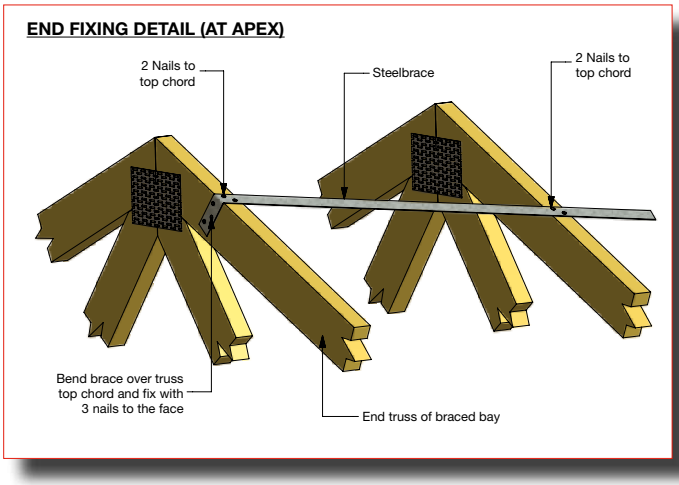
Z-sprocket overhang with double brick

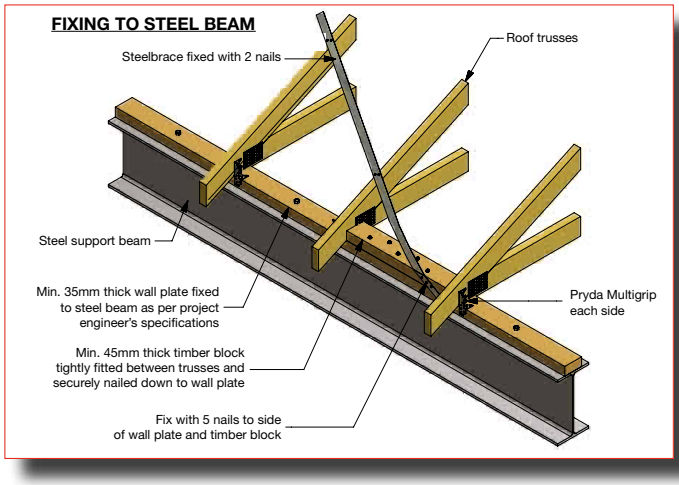


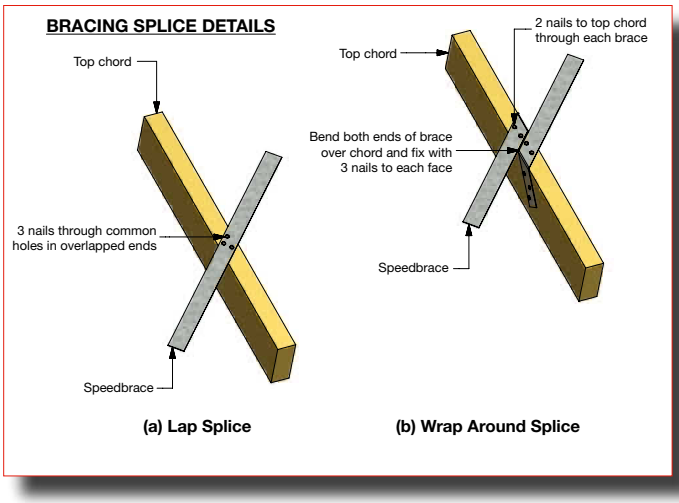
Z-sprocket overhang with cladding

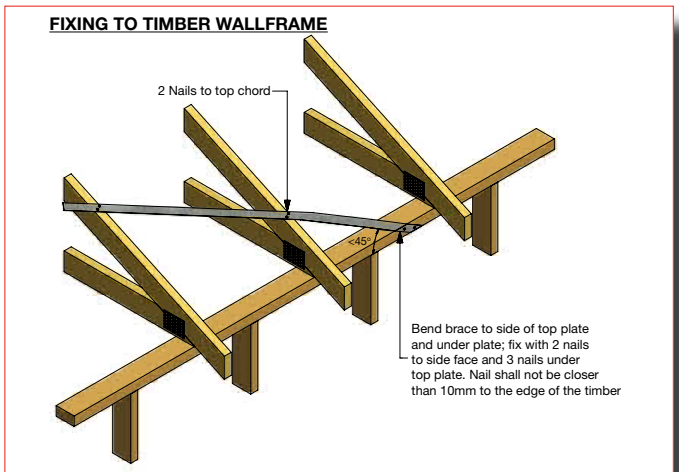
(j) Roof Bracing

Once the trusses have been installed, propped and the temporary bracing has been fixed, Speed Brace can be fixed to the trusses in accordance with a bracing layout as supplied by the truss manufacturer or by referring to the AS4440.









7. TRUSS TIE DOWN AND TRUSS TO TRUSS FIXINGS

(a) Producer Statement Report

After installing and bracing the trusses, the trusses should be fixed to the support structure with appropriate brackets and fixings to ensure that they do not pull away from the support structure when a strong wind blows across the roof.

It is a **requirement of AS1684, AS4440 *and the BCA*** that all timber components in a roof be fixed with appropriate connections to resist the design loads applied to them.

All roofs, especially sheet roofs, are subject to uplift from wind action and it is imperative that trusses, beams and rafters be tied to the supporting structure in an adequate fashion.

This calculation is shown in the Producer Statement Report which details how each truss should be fixed to the external and internal load bearing supports. The Producer Statement Report also specifies each truss to truss connection. The licensed Pryda fabricator will supply this report to the relevant checking authorities whilst the fabricator's layout will illustrate these connections for the builder on site.

Tie-downs to walls/beams:

All trusses need to be fixed at each support with 2 / 65x2.8 dia Skew Nails

All additional tie-downs are as follows:

Truss Mark	Support No.	Distance	Fixing	Support Jt Grp	Support Width	Truss Jt Grp	Uplift (kN)
M1	1	-	1/MG	JD4	90	JD5	-1.51
	5	2890	1/MG	JD4	90	JD5	-1.63
M10	1	-	Special	JD4	90	JD2	-30.70
	6	9525	Special	JD4	90	JD2	-35.58
M11	1	-	2/MG	JD4	90	JD4	-4.70
	6	8790	2/MG	JD4	90	JD4	-6.69
M12	1	-	2/MG	JD4	90	JD5	-4.11
	6	7560	2/MG	JD4	90	JD5	-5.43
M13	1	-	1/MG	JD4	90	JD4	-3.35
	5	6260	2/MG	JD4	90	JD4	-4.72
M14	1	-	1/MG	JD4	90	JD5	-3.20
	4	6260	2/MG	JD4	90	JD5	-4.13
M15	1	-	1/QHS6wr	JD4	90	JD2	-10.07
	4	6260	1/QHS6wr	JD4	90	JD2	-11.40
M2	1	-	1/MG	JD4	90	JD2	-2.72
	3	2890	1/MG	JD4	90	JD2	-2.57
M3	1	-	1/MG	JD4	90	JD5	-2.66
	4	4260	1/MG	JD4	90	JD5	-2.40
M5	1	-	2/MG	JD4	90	JD5	-4.28
	6	9295	2/MG	JD4	90	JD5	-5.52
M6	1	-	2/MG	JD4	90	JD5	-3.92
	7	9205	2/MG	JD4	90	JD5	-5.43
M7	1	-	2/MG	JD4	90	JD5	-3.88
	7	9113	2/MG	JD4	90	JD5	-5.39
M8	1	-	2/MG	JD4	90	JD5	-4.38
	7	9012	2/MG	JD4	90	JD5	-6.09
M9	1	-	2/MG	JD4	90	JD4	-4.84
	6	8907	2/MG	JD4	90	JD4	-6.78

Note: The fixing type shown 'Special' signifies that none of the standard Pryda connectors are suitable for this connection. A special connector is required.

Secondary fixings (hip & gable ends, valleys):

All trusses are to be fixed at each wall beam support with 2/65x2.8 dia Skew Nails

All additional connections are as follows:

Hip truss to truncated girder	3 face nails, bottom chords
Jack truss to truncated girder	3 skew nails or back face nails, bottom chords
Creeper truss to hip truss	3 face nails, top and bottom chords
Top chord extensions	2 skew nails
Valley trusses	1 skew nail
Outriggers	2 skew nails

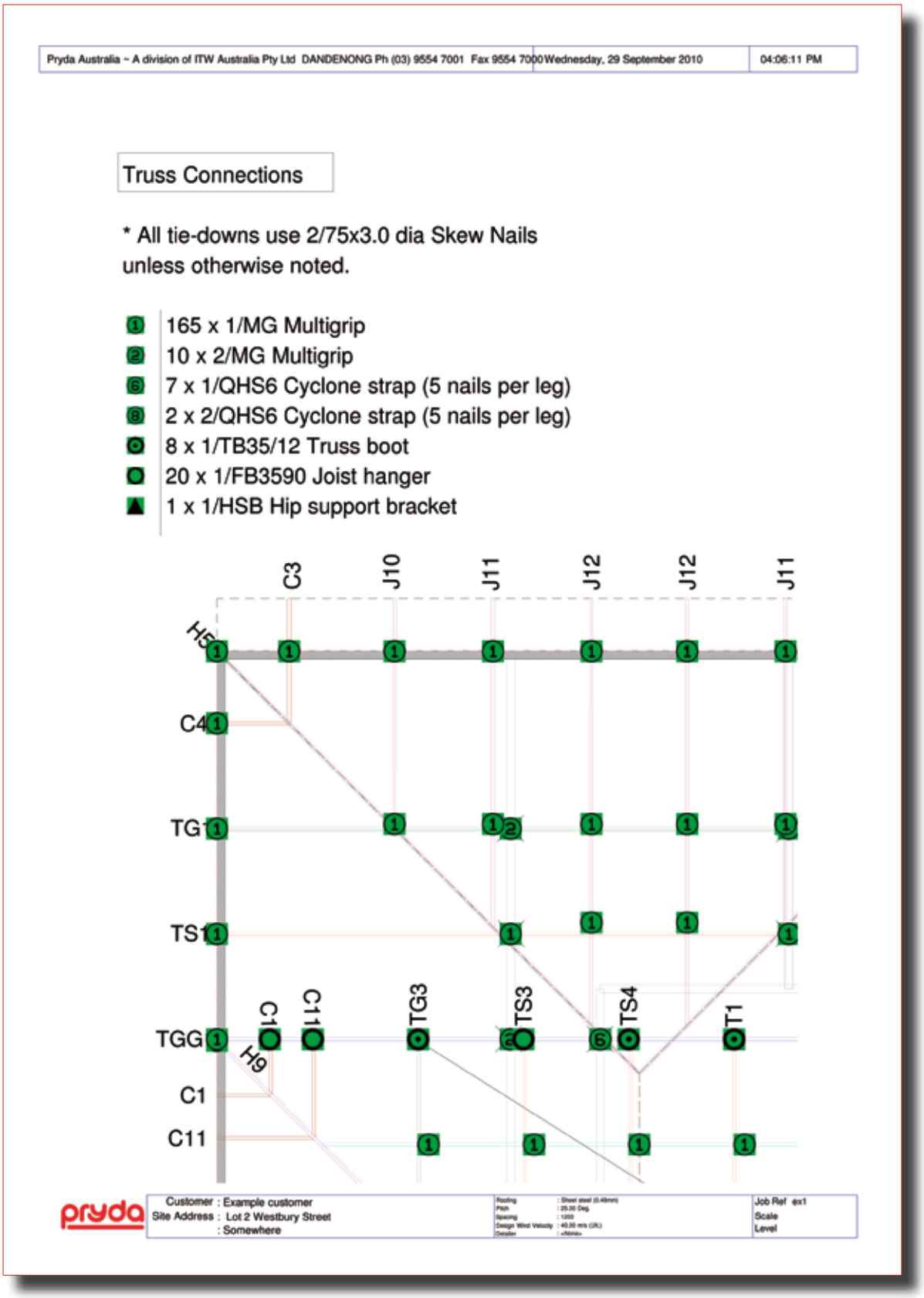
Supporting Truss	Supported Truss	Top Chord	Bottom Chord
(Various)	OR2	1/MG	-
	OR3	1/MG	-
M10	OR2	1/MG	-
M15	OR3	1/MG	-
M2	OR1	1/MG	-

Uplift Reaction

Fixing Detail

Truss to Truss Connections

All the tie downs and truss to truss connections are designed by the licensed Pryda fabricator using the Pryda software. A plan finishing layout is supplied to the truss erector that nominates the correct fixings, tie downs and their location. Below is an extract of a layout.



Pryda Australia ~ A division of ITW Australia Pty Ltd DANDENONG Ph (03) 9554 7001 Fax 9554 7000 Wednesday, 29 September 2010 04:06:11 PM

Truss Connections

* All tie-downs use 2/75x3.0 dia Skew Nails unless otherwise noted.

- 1 — 165 x 1/MG Multigrip
- 2 — 10 x 2/MG Multigrip
- 6 — 7 x 1/QHS6 Cyclone strap (5 nails per leg)
- 8 — 2 x 2/QHS6 Cyclone strap (5 nails per leg)
- ⊙ — 8 x 1/TB35/12 Truss boot
- ○ — 20 x 1/FB3590 Joist hanger
- ▲ — 1 x 1/HSB Hip support bracket

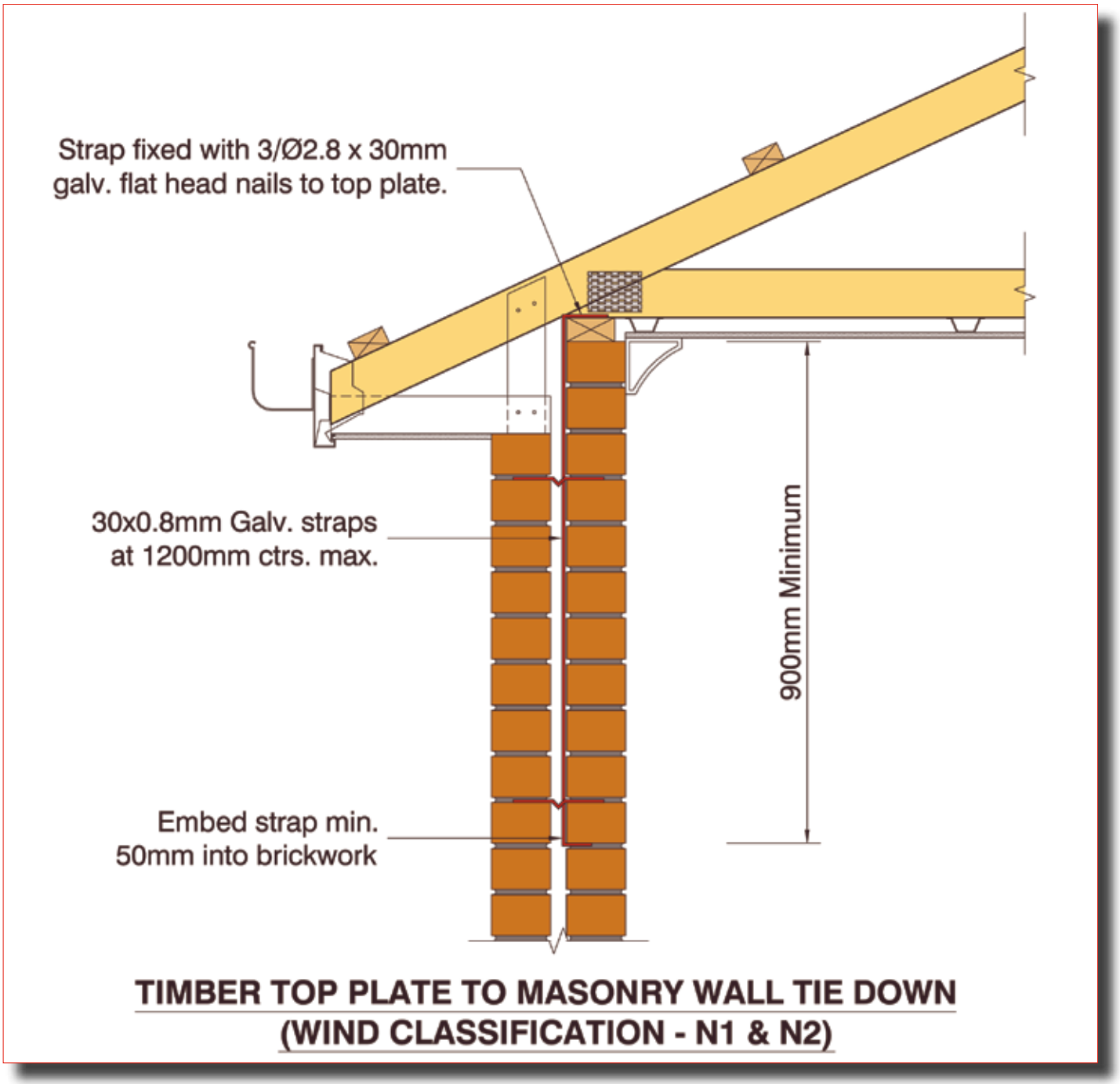
Customer : Example customer
Site Address : Lot 2 Westbury Street
: Somewhere

Job Ref ex1
Scale
Level

(b) Tie Down For Top Plate To Masonry

It is a requirement of the BCA to tie down timber top plates to masonry walls at a spacing of not more than 1200mm centres to resist wind uplift loads. The tie down strap should be a minimum 0 x 0.8mm and fixed a minimum of 50mm into the mortar join a minimum of 900mm down from the top of the brickwork.

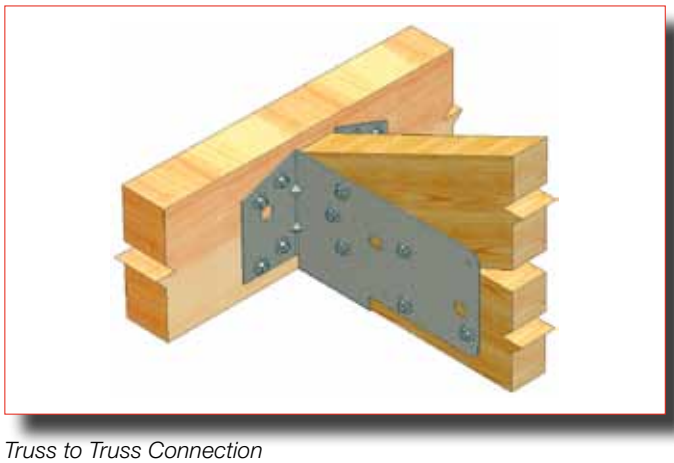
This type of fixing covers designs of standard trusses up to 10m span and within N1 and N2 wind load classifications. Please consult the designer for wind classifications outside of N1 and N2.



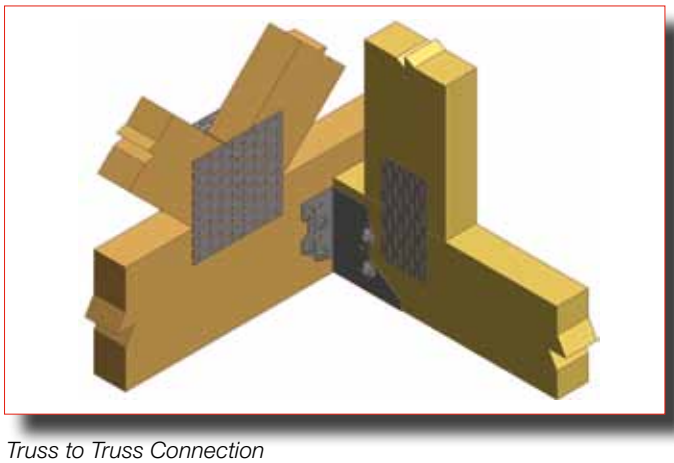
TIMBER TOP PLATE TO MASONRY WALL TIE DOWN (WIND CLASSIFICATION - N1 & N2)

(c) Truss to Truss Connections

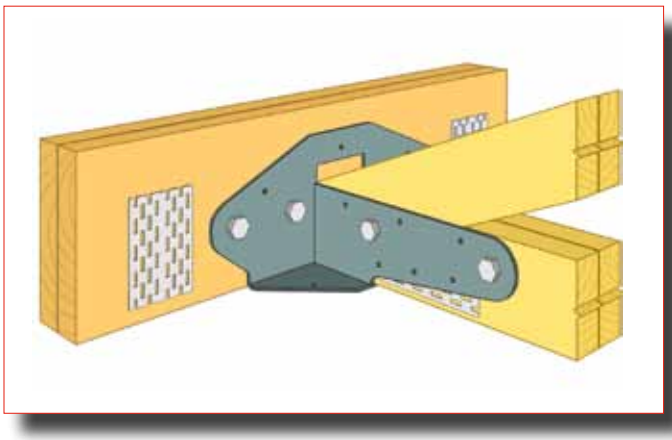
Each truss to truss fixing should be installed in accordance with Pryda's technical literature – supplied as downloadable PDF's on the Pryda website www.pryda.com.au



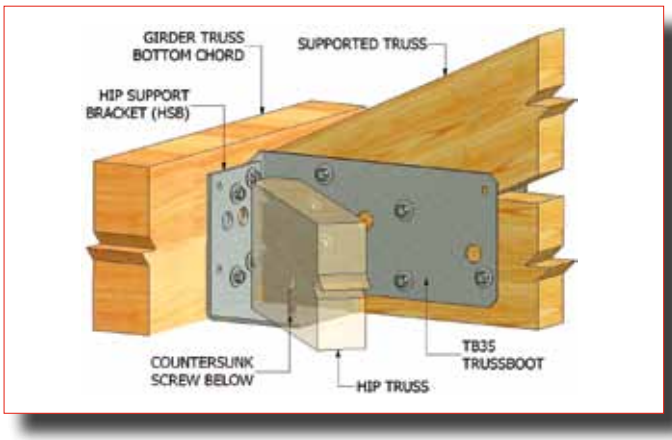
Truss to Truss Connection
Multi-Fix Truss Boot



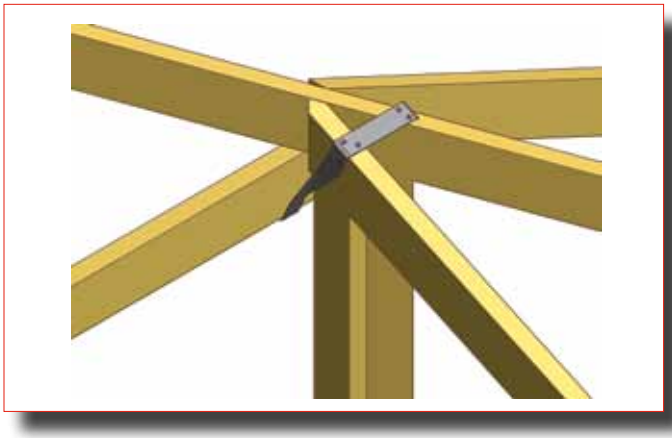
Truss to Truss Connection
Framing Bracket



Truss to Truss Connection
Heavy Duty Truss Boot



Truss to Truss Connection with Hip
Multi-Fix Truss Boot with Hip Support Bracket

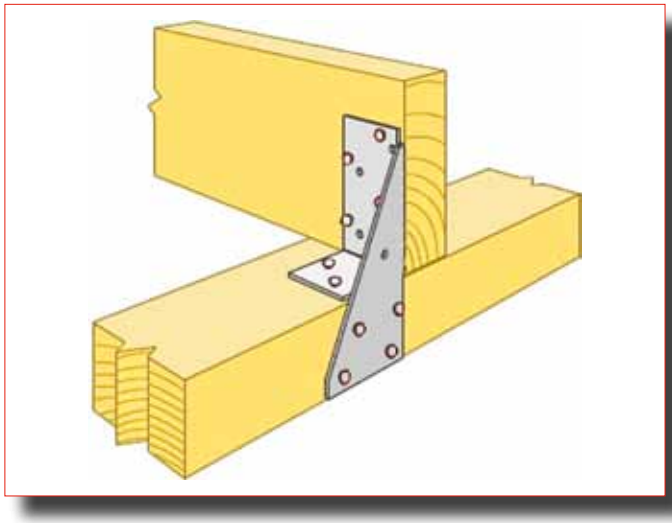


Truss to Truss Connection
Cyclone Strap tying down a Hip Truss to a Girder Truss

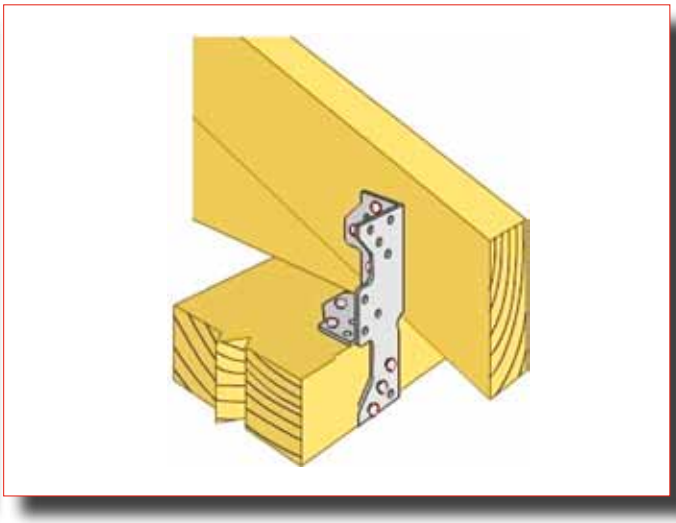
(d) Truss/Rafter to Top Plate Tie-Down Connections

Each tie down fixing should be installed in accordance with Pryda technical literature – supplied as downloadable PDF's on the Pryda website **www.pryda.com.au**

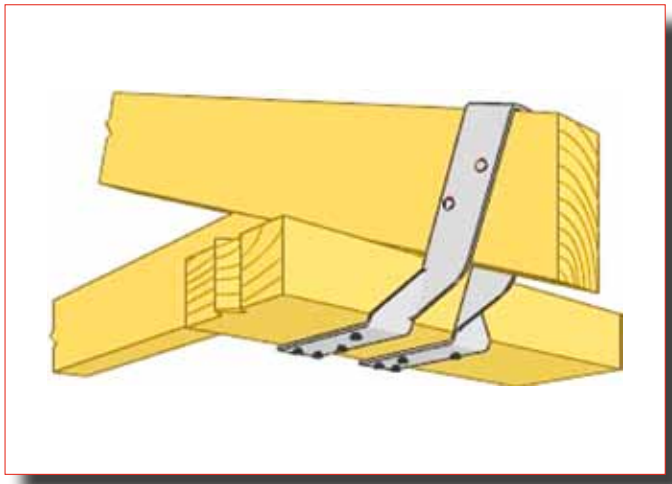
Timber Wall Frames



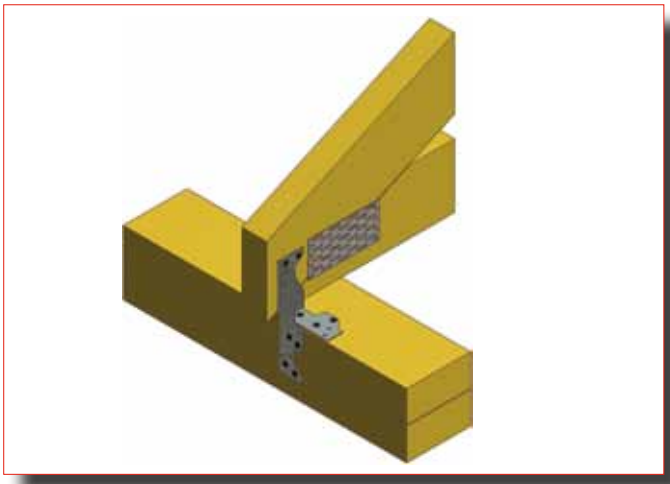
Triple Grip



Multigrip

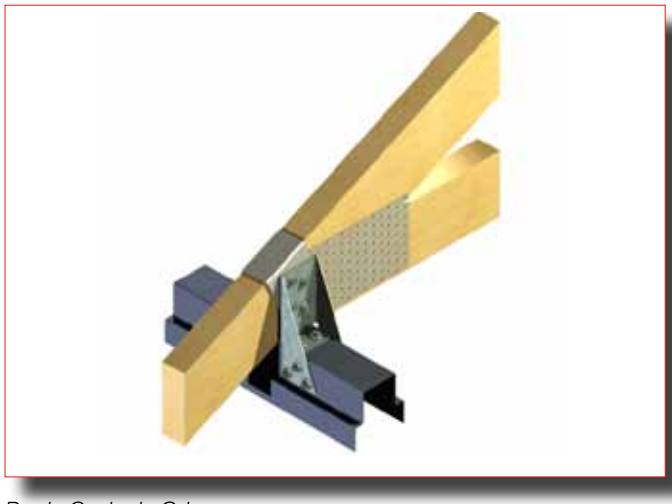


Cyclone Strap

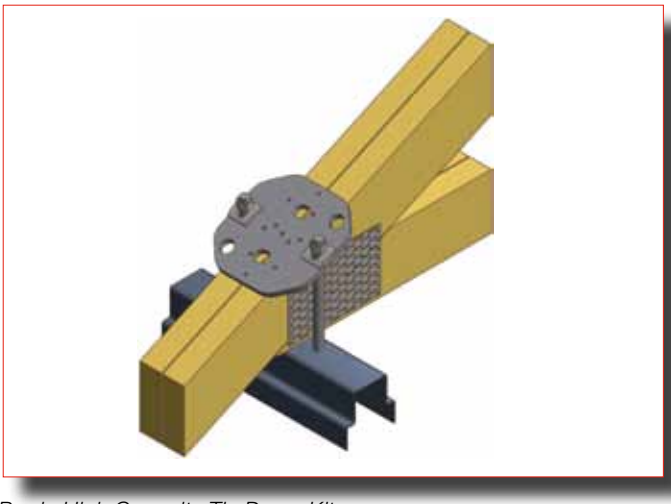


Long Multigrip

Steel Wall Frames



Pryda Cyclonic Grip



Pryda High Capacity Tie Down Kit

8. ACHIEVING COMPLIANT TIE DOWN FOR STICK BUILT CONSTRUCTION

a. RAFTER TIE-DOWN SELECTION TABLE - For Non-Cyclonic Regions

JD5 Joint Group (1) (eg: MGP10)

ULW (2)	SHEET ROOF						TILE ROOF			
	N1/N2 Wind Class			N3 Wind Class			N1/N2	N3 Wind Class		
	Rafter Spacing (mm)						Rafter Spacing (mm)			
	600	900	1200	600	900	1200	ALL	450	600	900
1500	TT	TT	TT	TT	MG	MG	N	TT	TT	TT
2000	TT	TT	MG	MG	MG	MG	N	TT	TT	MG
2500	TT	MG	MG	MG	MG	2MG	N	TT	TT	MG
3000	TT	MG	MG	MG	2MG	2MG	N	TT	MG	MG
3500	TT	MG	MG	MG	2MG	2MG	N	TT	MG	MG

JD4 Joint Group (1) (eg: MPG12, LVL)

ULW (2)	SHEET ROOF						TILE ROOF			
				N3 Wind Class			N1/N2	N3 Wind Class		
	Rafter Spacing (mm)						Rafter Spacing (mm)			
	600	900	1200	600	900	1200	ALL	450	600	900
1500	N	TT	TT	TT	TT	MG	N	N	N	TT
2000	N	TT	TT	TT	MG	MG	N	N	TT	TT
2500	TT	TT	MG	TT	MG	MG	N	TT	TT	MG
3000	TT	TT	MG	MG	MG	2MG	N	TT	TT	MG
3500	TT	MG	MG	MG	MG	2MG	N	TT	TT	MG

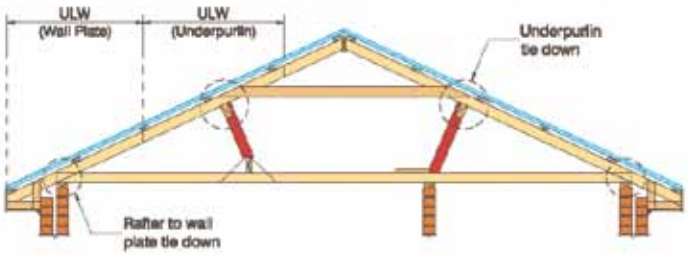
Note:

(1) The Joint Group reflects the lower of the rafter and supporting member joint groups.
(Use JD5 for MGP10, unless the timber is heart excluded)

(2) ULW refers to Uplift Load Width, determined as per AS1684:2010 clause 9.6.2.

(3) The above tables include the weight of a minimum plasterboard ceiling in addition to the roofing material.
(sheet roof = 40 kg/sqm; tile roof = 90 kg/sqm)

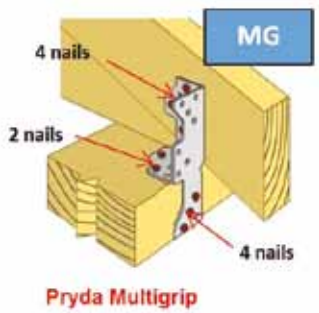
(4) Refer to AS1684:2010 or contact a Pryda design office for situations outside the above table.



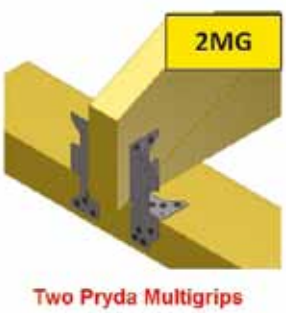
LEGEND

N	- Nominal fixing, using 2/75x33 dia glue coated or deformed shank skew nails.
TT	- Pryda Truss Tie + 2 skew nails
MG	- Pryda Multigrip + 2 skew nails. Pryda Triple Grips or Uni-ties may be used as substitutes.
2MG	- Two Pryda Multigrips + 2 skew nails. Pryda Cyclone Straps (QHS6) wrapped under plate may be used as a substitute.

Pryda Truss Tie



Pryda Multigrip



Two Pryda Multigrips

b. UNDERPURLIN TIE-DOWN SELECTION TABLE - For Non-Cyclonic Regions

JD5 Joint Group (1) (eg: MGP10)

ULW (2)	SHEET ROOF						TILE ROOF			
	N1/N2 Wind Class			N3 Wind Class			N1/N2	N3 Wind Class		
	Fixing Spacing (mm)						Fixing Spacing (mm)			
	1800	2700	3600	1800	2700	3600	ALL	1800	2700	3600
1500	MG	MG	2MG	2MG	2MG	SB	N	MG	2MG	2MG
2000	MG	2MG	2MG	2MG	SB	2SB	N	MG	2MG	SB
2500	MG	2MG	SB	2MG	2SB	2SB	N	2MG	2MG	2SB
3000	2MG	2MG	SB	SB	2SB	2SB	N	2MG	SB	2SB
3500	2MG	SB	2SB	SB	2SB	2SB	N	2MG	2SB	2SB

JD4 Joint Group (1) (eg: MPG12, LVL)

ULW (2)	SHEET ROOF						TILE ROOF			
	N1/N2 Wind Class			N3 Wind Class			N1/N2	N3 Wind Class		
	Fixing Spacing (mm)						Fixing Spacing (mm)			
	1800	2700	3600	1800	2700	3600	ALL	1800	2700	3600
1500	MG	MG	MG	MG	2MG	2MG	N	MG	MG	2MG
2000	MG	MG	2MG	2MG	2MG	2SB	N	MG	2MG	2MG
2500	MG	2MG	2MG	2MG	SB	2SB	N	MG	2MG	SB
3000	MG	2MG	2MG	2MG	2SB	2SB	N	2MG	2MG	SB
3500	MG	2MG	SB	SB	2SB	2SB	N	2MG	SB	2SB

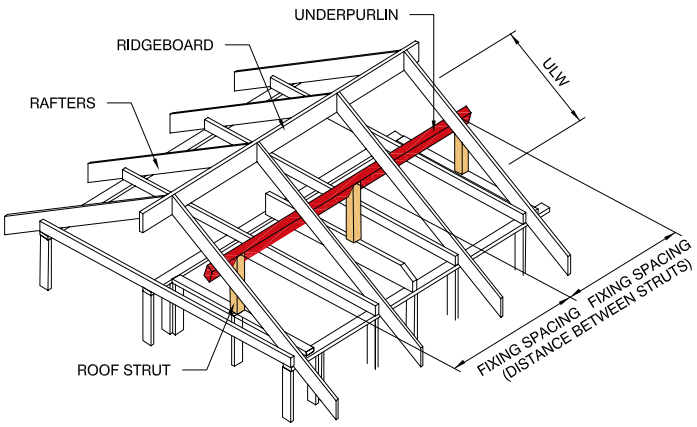
Note:

(1) The Joint Group reflects the lower of the underpurlin and supporting strutting member joint groups.
(Use JD5 for MGP10, unless the timber is heart excluded)

(2) ULW refers to Uplift Load Width, determined as per AS1684:2010 clause 9.6.2 .

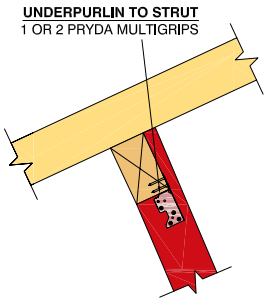
(3) The above tables include the weight of a minimum plasterboard ceiling in addition to the roofing material.
(sheet roof = 40 kg/sqm; tile roof = 90 kg/sqm)

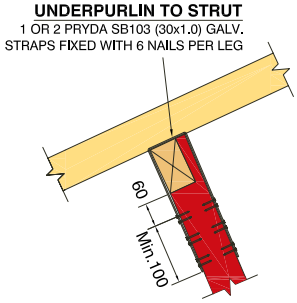
(4) Refer to AS1684:2010 or contact a Pryda design office for situations outside the above table.



LEGEND

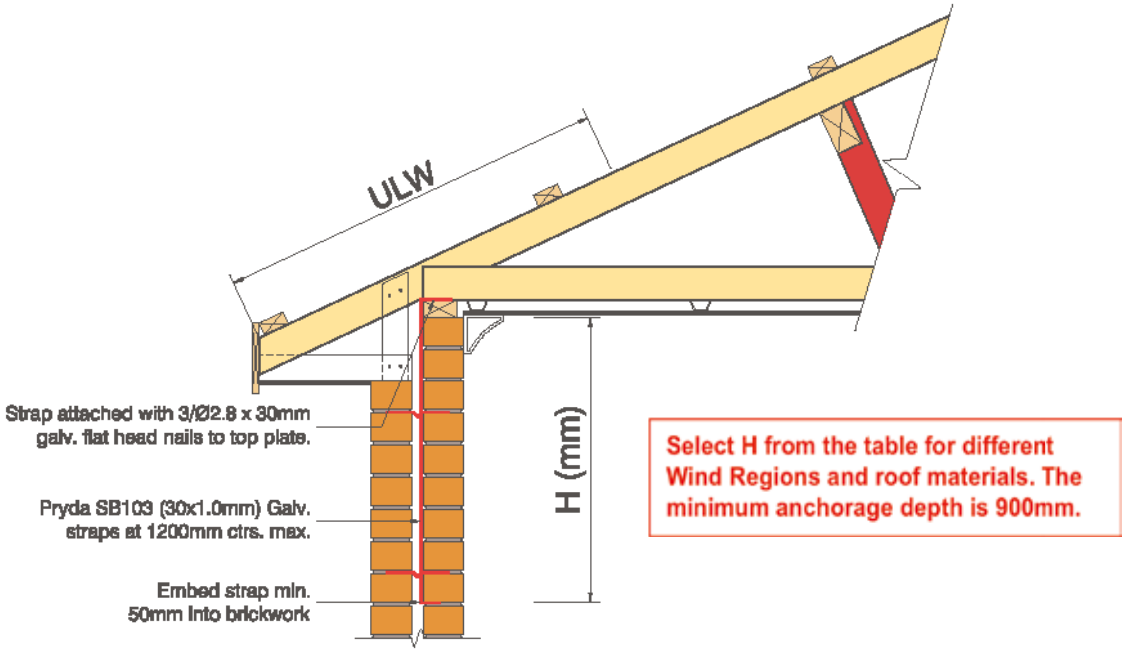
MG	- Pryda Multigrip + 2 skew nails.
2MG	- Two Pryda Multigrips + 2 skew nails.
SB	- Pryda SB103 (30x1.0) strap fixed with 6/3.15x35 nails (or equivalent) per leg.
2SB	- Two Pryda SB103 straps, each fixed with 6 nails per leg.





c. WALL PLATE TIE-DOWN SELECTION TABLE - For External Walls

Anchorage into masonry for maximum tie -down spacing of 1200mm



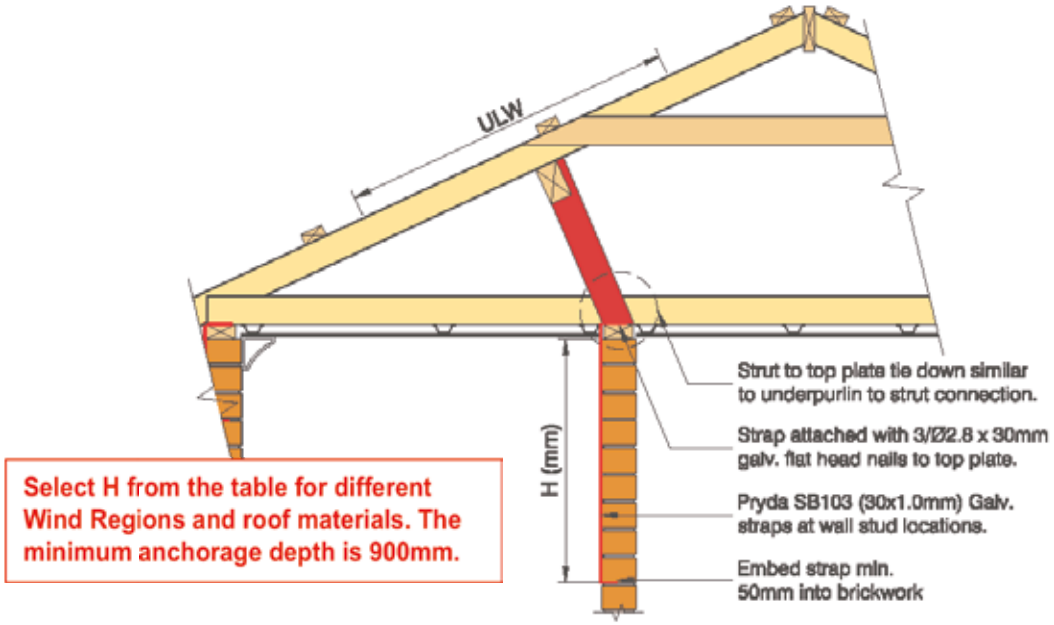
TIMBER TOP PLATE TO MASONRY WALL TIE DOWN

ULW	N1/N2 Wind Regions		N3 Wind Regions	
	Anchorage Depth (H) into Cavity Masonry Wall (mm)			
	TILE roof	SHEET roof	TILE roof	SHEET roof
1500	900	900	900	1200
2000	900	900	1200	1500
2500	900	1200	1200	1800
3000	900	1200	1500	**2100**
3500	900	1500	1800	**Special**

Note:
(1) ULW refers to Uplift Load Width, determined as per AS1684:2010 clause 9.6.2 .
(2) The table value assumes a masonry wall surface density of 200 kg/sqm, mobilising only the inner leaf of the cavity masonry wall.
(3) Pryda SB103 strap is 30 x 1.0mm and manufactured using G300 Z275 steel.
Check and confirm with local authorities regarding minimum corrosion protection requirement for the project.
(4) It is assumed that the selected wall plate is adequate for the designed anchorage spacing. A maximum anchorage spacing of 1200mm is considered in determining the above table values.
(5) At openings : Special anchorage and wall plate design will be required at either side of openings if the selected anchorage depths (H) cannot be achieved.
(6) Light weight bricks: If bricks lighter than the assumed 200 kg/sqm is used, it is recommended that the table values be increased by 300mm.

d. WALL PLATE TIE-DOWN SELECTION TABLE - For Internal Walls

For Wall Struts Located at maximum 1800mm and 2400mm centres



For Wall Struts at 1800mm c/c

ULW	N1/N2 Wind Regions		N3 Wind Regions	
	Anchorage Depth (H) into Cavity Masonry Wall (mm)			
	TILE roof	SHEET roof	TILE roof	SHEET roof
1500	900	900	900	1500
2000	900	900	1200	1800
2500	900	1200	1500	2100
3000	900	1500	1800	Special
3500	900	1800	2100	Special

For Wall Struts at 2400mm c/c

ULW	N1/N2 Wind Regions		N3 Wind Regions	
	Anchorage Depth (H) into Cavity Masonry Wall (mm)			
	TILE roof	SHEET roof	TILE roof	SHEET roof
1500	900	1200	1200	1800
2000	900	1200	1500	Special
2500	900	1500	2100	Special
3000	900	1800	Special	Special
3500	900	2100	Special	Special

Note:

(1) ULW refers to Uplift Load Width, determined as per AS1684:2010 clause 9.6.2 .

(2) The table value assumes a masonry wall surface density of 200 kg/sqm

(3) Pryda SB103 strap is 30 x 1.0mm and manufactured using G300 Z275 steel.

(4) At openings : Special anchorage and wall plate design will be required at either side of openings if the selected anchorage depths (H) cannot be achieved.

Contact Pryda

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